

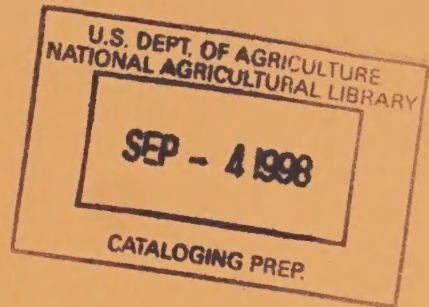
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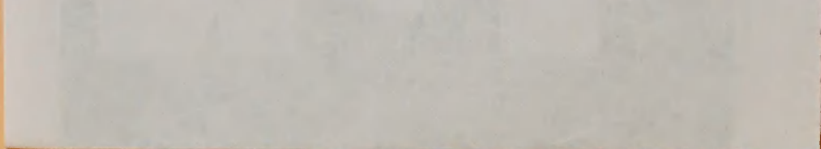
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**ECONOMIC RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE**



**CURRENT PROGRAM
and
PROGRESS REPORT
of the
MARKETING ECONOMICS DIVISION**

Fiscal Year 1970



This progress report is primarily a tool for use of scientists and administrators in program coordination, development and evaluation. The summaries of progress include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed, will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff and others having a special interest in the development of public agricultural research programs.

This progress report was compiled in the Marketing Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C. 20250.

November 1970

INTRODUCTION

Agriculture, perhaps more than any other subsector member of the economy, is required to accommodate its activities to conditions that are market prescribed. These market determinations are not arrived at in an even-handed manner because most of agriculture remains atomistically competitive relative to the economic composition of its markets. As a result, these markets have much to say about the economic status of the farming industry.

Agriculture looks to factor markets, noted for rather rigid pricing policies, for production inputs. Farm production expenses currently total over \$38 billion, or about four-fifths of agriculture's \$47 billion cash receipts from marketings. To realize this income the farm sector must in turn rely upon marketing firms that extract over two times as much compensation or approximately \$108 billion from the civilian economy for assembling, transporting, processing, wholesaling, and retailing agriculture's basic output. Export marketing costs increase the bill even further.

Agriculture must operate without the benefit of economic leverage. The industry is positioned between factor markets which are not fully competitive and product markets that siphon off a substantial share of revenue flows that are the basis of farm income. Therefore, market performance takes on paramount significance. For this reason, finding out what needs to be and can possibly be done toward improving market performance is the basic objective of the Marketing Economics Division. A program that accomplishes this objective cannot be rigidly narrow or excessively exclusive. Malfunctioning of single marketing activities has been known to be responsible for short-circuiting effective market performance. Marketing firms become disoriented and lose performance capability. Lingering institutions and practices and customs dictated by historical need sometimes impede progress. And sometimes, inefficiencies emerge simply because organizations of entire industry subsectors are no longer compatible with changing requirements of the economy.

The Division program incorporates this breadth of perspective as much as problem urgency and resources will allow. The Division is continually called upon to provide answers about the performance of specific marketing functions and activities. The Congress, program agencies and industry groups ask for research investigations as diverse as economic analyses of the impact of synthetics and substitutes in agricultural markets of the economic implications of pollution abatement, of the warehousing and distribution functions for program stored commodities, of the agricultural futures market, of specific pricing and marketing practices in food retailing, of the potential for air transport of agricultural commodities and a variety of other problems. In most instances, these apparently isolated bits of research result in a two-way payoff. These efforts provide urgently needed answers to immediate questions. And, they also furnish otherwise unavailable information materially helpful to the implementation of market systems performance research which is the core program of the Division.

This report summarizes marketing research in terms of several broad problem areas. Elements of research are addressed to questions identified with particular problem areas; and so categorized form the basis for discussion about progress in the research program and plans for future activity.

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MEASUREMENT AND EVALUATION OF PRICE SPREADS AND OTHER INDICATORS OF MARKET PERFORMANCE

SITUATION

Since the mid-1950's the Congress has appropriated funds specially designated for deriving and studying price spreads. A continuing research program has been developed by the Marketing Economics Division to provide current data on price spreads for a market basket of farm foods and aggregate food marketing costs. Price spreads also are evaluated for individual commodities.

The food marketing system touches the lives and affects the economic posture of every citizen. In its aggregate form it is the single biggest operation of the economic system moving 100 billion dollars of goods and services each year. Farmers, consumers and the Government have long been concerned about market performance in terms of the spread or difference between retail prices and farm returns. The interests of the various segments dependent on the system often conflict--the consumer's desire for low-food costs, the marketing firm's desire to maximize profits and the farmer's desire for higher returns.

The computation and publication of market basket statistics provide a valuable indicator of certain aspects of performance important for policy use and as market intelligence guides relative to changes in retail cost, marketing spreads, and farm values of farm foods.

Similarly, the marketing bill statistics provide information on trends in total cost of marketing and changes in the cost components. These statistics and related data on input productivity are also important aggregate guides in analyzing changes in the food system in general and for particular segments.

While these measures are valuable, there still exist problems of assessing the efficiency and the equity of the operation of the marketing system and its subsectors. Many of the questions pertain to conduct of the agencies in the system, in terms of their responsiveness to changes in demand as well as many questions revolving around equity issues. Then too, performance is multi-dimensional and existing measures frequently are inadequate to answer particular policy and operational problems.

In order to more fully approach questions of performance, emphasis is being placed on two aspects of research. One is the continuous review and upgrading of data and methodology for computing and evaluating the existing indicators for which we have responsibility--those associated with the market basket, the marketing bill, and other related market statistics such as measures of productivity.

A second aspect to receive emphasis involves studies of the feasibility of developing new or improved measures to assess the intricacies of the system and its parts. Such relevant measures are needed to supplement those currently available to answer questions concerning the degree to which the marketing system is making the best and most effective use of economic resources and in resolving more adequately the sometimes conflicting goals of farmers, consumers, and marketing firms and the equity with which they participate in the output of the system.

PROGRESS

Market Basket

A concentrated effort has been directed in fiscal 1970 toward improvement of the market basket statistics so that data reported reflects as accurately as possible efficiency and equity performance indicators. Revised market basket statistics have been developed incorporating methodological changes which have improved data on retail prices and farm returns.

One of the improvements made was the development of procedures for taking into account the effect of price specials for beef and pork. Additional data are being used to estimate retail prices of pork as well as farm values of these products.

Other important steps include re-evaluation of conversion factors and development of new factors for fruits and vegetables. New methodology has been adopted to preserve comparability in retail prices when the Bureau of Labor Statistics changes its sample of cities or stores used in obtaining retail food prices.

A manuscript was prepared presenting the new data, analyzing it, and describing the methodology employed. The market basket statistics were revised from recent years back to the earliest period for which data were available. Indexes for the overall basket were revised back to 1913.

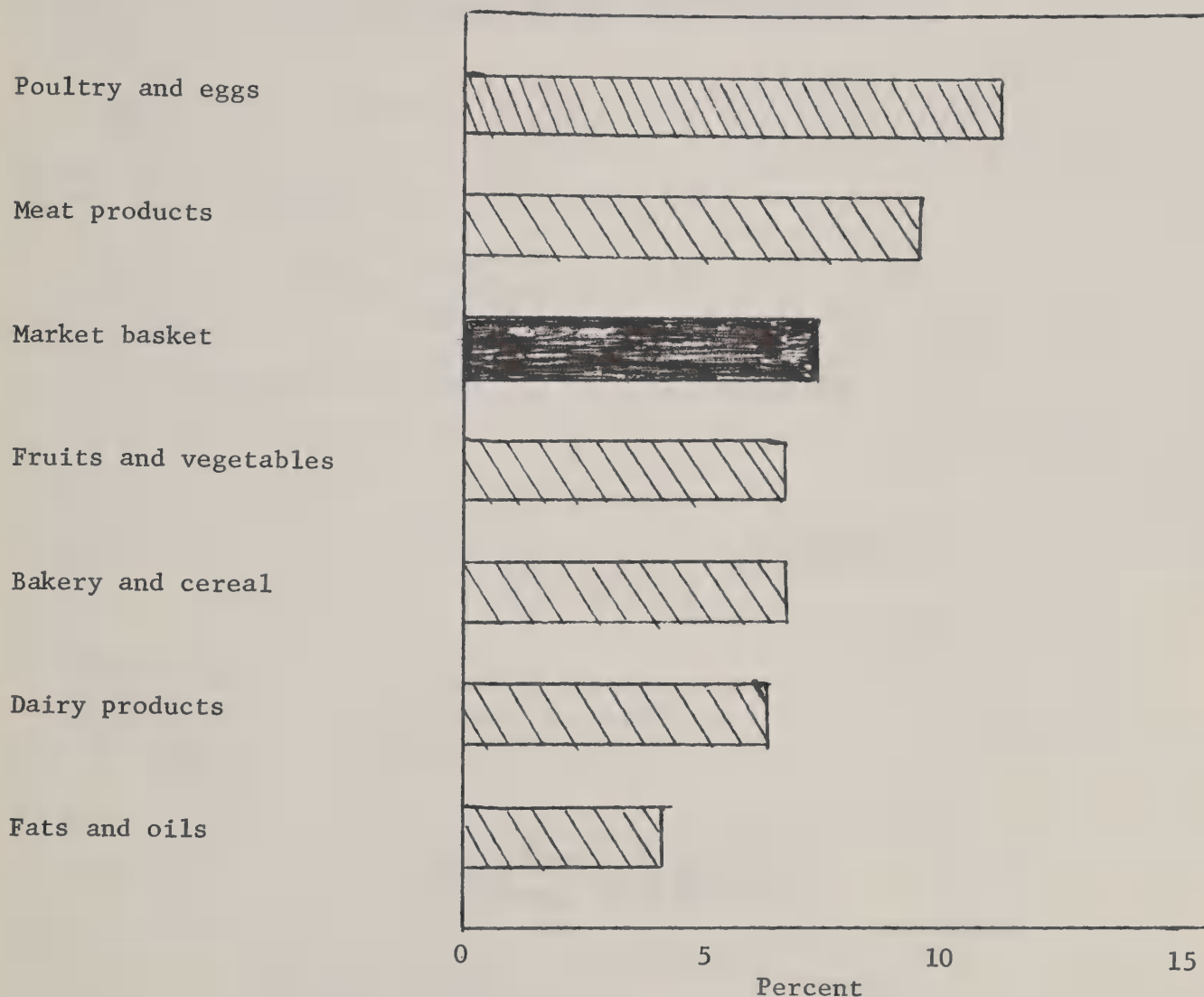
Marketing margins, as measured by the difference between the retail cost and farm value of a market basket of farm originated foods, have trended up sharply since June 1969. For the first 9 months of 1970, the marketing spread averaged a record 6.9 percent above a year earlier. Marketing spreads accounted for two-thirds of the 5.8 percent rise in the retail cost of the market basket in the first 9 months of 1970. Returns to farmers for these foods, up 4.3 percent, accounted for the remaining third.

All product groups in the market basket contributed significantly to the 6.9 percent increase in marketing spreads in the first 9 months of 1970 (Fig. 1). In comparison, spreads increased at an annual rate of 1.4 percent in the 1960's and 1.9 percent from 1968 to 1969. In 1970, spreads widened most for meat products and poultry and egg groups--about 10 percent (Fig. 2). Increases were more than 5 percent for fruits and vegetables, bakery and cereal, and dairy products.

Marketing Bill

Another important segment of the market statistics system of the Department is the marketing bill for farm foods. These statistics measure the total cost of transporting, processing, and distributing (wholesaling and retailing) U.S. farm foods. They show the distribution of consumer expenditures between the marketing system and farmers, and the distribution of marketing costs among commodity groups and individual cost components such as labor.

Increases in Marketing Spreads
1969 to 1970*

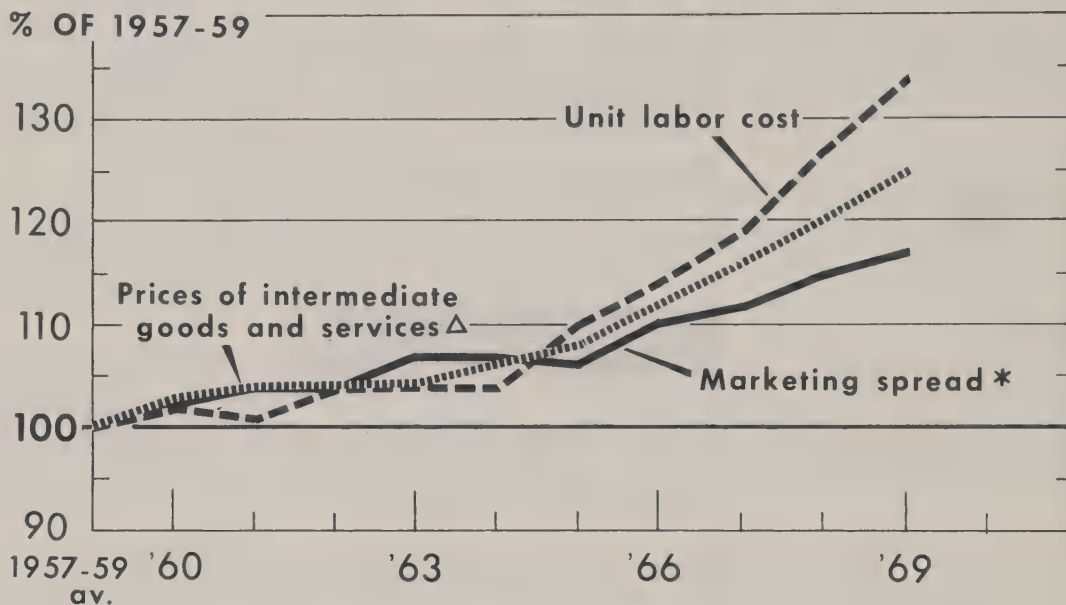


*Average for January-September.

Figure 1

In 1969, U.S. consumers spent \$95.3 billion for domestic farm foods. Of this amount \$63.2 billion represented marketing charges and \$32.1 billion returns to farmers (Fig. 3). Charges for marketing fruits and vegetables and meat accounted for about half of this total. The bill has increased an average of slightly over 4 percent per year during the past decade because of increases in the volume of products marketed and rising prices of marketing inputs, particularly labor. Labor costs, almost half of the bill, accounted for nearly all of the increase in the bill in 1969. Labor cost per unit of product marketed, a partial measure of economic efficiency, rose substantially (6.3 percent) as a result of higher wage rates and a slowdown in productivity.

MARKETING SPREAD AND COSTS OF MARKETING INPUTS, 1960'S



* FOR MARKET BASKET OF FARM FOODS.

Δ CONTAINERS, PACKAGING MATERIALS, UTILITIES, RENT, PROPERTY INSURANCE, TELEPHONE, ETC.

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Figure 2

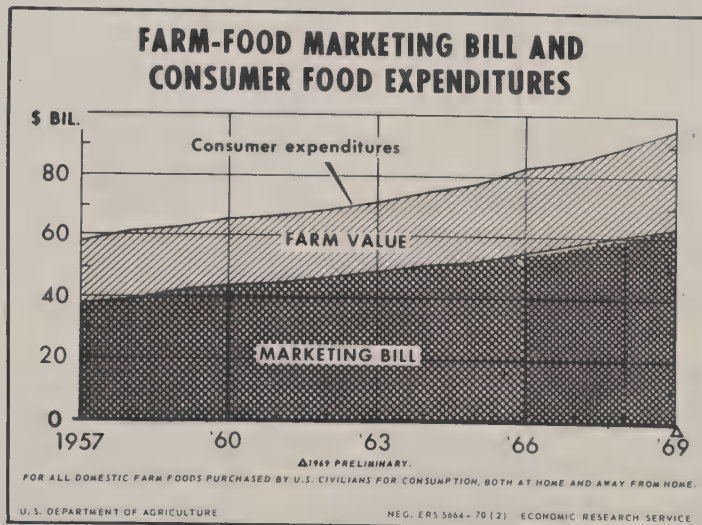


Figure 3

A large and expanding part of the retailing portion of the marketing bill is associated with marketing food through away-from-home eating establishments. Away-from-home eating establishments have a gross margin $2\frac{1}{2}$ times that of food stores. Therefore, the increase in away-from-home eating has had a dramatic impact on the marketing bill.

Research was initiated in fiscal 1970 to develop a separate marketing bill for away-from-home eating. This will provide data for analysis and evaluation of the costs and farm values associated with marketing foods through public eating places compared with food stores.

Estimates show that away-from-home eating accounted for more than one-fourth of the total consumer expenditures for farm foods in 1969. Public eating places have two-thirds of the away-from-home market while hospitals, schools, and other institutions supply the remaining portion of the market. Marketing costs are higher for away-from-home eating than for the at-home-food market. The retailing function, which involves the preparation and sale of the food accounts for over half of the total value of sales for eating places, but only one-fifth of the total value of food store sales. This differential in cost reflects services performed in eating places, cooking and serving food, as well as procurement and distribution which are also performed by food stores. Progress has been made in estimating the bill for away-from-home marketing. More work is needed to complete and validate these estimates with other available data.

Livestock

New procedures for estimating the national average composite prices of beef and pork were developed and implemented commencing July 1, 1969, consistent with recommendations of the National Commission on Food Marketing. Principal changes included: At retail, adjustments for both volume effect and price effect of weekend meat price specials, updating byproduct credits and values, and allowance for shrink in the retail case; at other market levels, changes in basic market quotations for slaughter stock and wholesale dressed meats. Revisions resulted in a somewhat smaller farm-to-retail spread for beef but only fractional change in the average spread for pork.

Poultry and Eggs

A continuing monthly price-spread series is maintained for 12 cities and 7 products (Grade A large, medium, and small eggs; frying chickens; and large, medium, and small turkeys). The farm-to-retail price spread for Grade A large eggs in 1969 was 21.5 cents compared to 20.8 cents in 1968; for frying chickens its spread was 22.8 cents in 1969 compared to 21.7 cents in 1968; and for turkeys 21 cents in 1969 and 19.6 cents in 1968.

Bread

As in almost every year since World War II, the retail price and the farm-retail spread for white pan bread continued to increase in 1969. The retail price of a 1-pound loaf of white bread was 23 cents in 1969, up 0.6 cent over 1968. Although the annual rate of increase slowed down from about 3.2 percent during the 1950's to about 1.8 during the 1960's, the rate of increase in 1969 over 1968 was up to about 2.7 percent, and between July 1969 and July 1970 the

increase was 5.2 percent. Since the farm value of ingredients fluctuated downward from 3.3 cents, about the same level for 1947-49 and 1969, practically all of the increase in bread prices has been due to increases in the farm-retail spread.

As plans indicated last year, a bread-type flour price survey to collect monthly prices from mills was initiated on a test basis in September 1969. These data indicate the miller's spread to be 0.1 cent less per pound loaf of bread than estimates based on secondary sources of flour price estimates now used.

Soybean and Cottonseed Oils

Shortening and salad and cooking oils are marketed over a broad price range, with brands playing an important part in both product differentiation and sales promotion efforts in marketing these products. On the average for all shortening sold in all types of retail outlets in 1969, the wholesale price spread (the difference between the average mill value of crude oil in a 3-pound pack of shortening and the price received by wholesalers), was 39.9 cents for a 3-pound pack. The retail price spread (the difference between wholesaler's prices and retail prices) was 13.7 cents. Both the wholesale and the retail price spreads widened between 1947 and 1969.

Other Measures of Market Performance

Labor productivity is an important indicator of market performance. Indexes of output per man-hour in food manufacturing have been extended to 1968. During 1959-68, output per man-hour in factories processing farm-originated foods increased an average of 3.5 percent--a much larger increase than in the preceding decade. The gain in labor productivity was slightly faster than the rise in factory output (2.6 percent). Thus, the number of man-hours declined slightly.

Productivity of all food processing industries gained during 1959-68. The meat industry had the largest average increase (4.2 percent). Other industries having above average increases were dairy, grain mill, bakery, and sugar. Poultry and eggs had the smallest increase, 2.6 percent.

A study conducted with the Marketing Science Institute to examine the adequacy of currently used performance measures and to evaluate the feasibility of developing new measures is nearing completion. With respect to existing measures, the findings indicate that except for two criteria--allocative and technical efficiency--attempts to verify the relationship between market structure and market performance have been frequently inconclusive, conflicting, or extremely tenuous. The study suggests alternative approaches be used to evaluate other performance criteria such as income distribution and progressiveness. In productivity analysis, it was suggested that productivity measures incorporating capital as well as labor inputs be developed.

In addition to measures of efficiency, an important dimension of performance is the extent to which product and service alternatives conform to the wants and needs of individual consumers. Existing measures were found to be inadequate to evaluate this aspect of performance. Two new measures were proposed. One

measures the degree of correspondence between various combinations of retail services and the demand for these services. The second measure is an aggregate measure of consumer satisfaction involving costs of marketing services and benefits as perceived by consumers.

PLANS

Benchmarking the Marketing Bill

Benchmark estimates of consumer expenditures, the farm value, and the marketing bill have been made for census years back to 1929 by the commodity flow method. Annual estimates are derived by a less comprehensive method. Estimates of the marketing bill made by commodity flow method rely heavily on unpublished data in the Censuses of Manufactures and of business. These data have recently become available for 1963. During the coming year annual estimates of the marketing bill statistics will be adjusted to the more precise data developed by the commodity flow method.

Estimating Components of the Marketing Bill

To explain more fully rising marketing costs, continued emphasis will be placed on developing annual series for individual components--particularly containers, package and labeling, and costs identified with the away-from-home food market.

Marketing Bill for Away-From-Home Eating

Continued work on the away-from-home marketing bill will concentrate on dividing the marketing bill into agency components and to provide additive bills and farm values for at-home and away-from-home consumption.

Prices of Intermediate Goods and Services used in Marketing

To perform the multitude of services required in marketing farm food products, assemblers, processors, wholesalers, retailers, and away-from-home eating places employ a wide array of services from nonfarm businesses not directly engaged in marketing food products.

Indexes are being updated with unpublished data from the 1963 U.S. Department of Commerce input-output study showing the kinds and values of inputs used by each industry or industry group. In addition, some new BLS price indexes will be used.

Productivity in Food Distribution

Food distribution includes the activities of food wholesalers, retailers, and eating places. Labor productivity indexes for food distribution will be updated to 1967.

Development of New Data on Profits

The Division maintains a profit series for the 15 largest food chains. Data have recently become available which make it possible to expand the sample of food stores and to develop profit information on public eating places, food

wholesalers and restaurants in hotels and motels. A computer model will be developed to use data on publicly held corporations. This includes stocks traded over-the-counter and stocks listed at public exchanges and published by Moody's Investors Services. The model will provide, in addition to profit data, selected measures of performance: profit per dollar of sales, profit per dollar of assets, return on equity and other indicators. These indicators will be related to size of firm, type of firm and other firm characteristics.

Seasonal Indexes for Market Basket

Seasonal indexes for the newly revised market basket statistics will be computed. These computations will provide seasonal information on retail cost, farm value, and marketing spread for the market basket and its product groups, and for many individual food products.

Requirements and Productivity of the Food Subsystem

Input-output tables of the economy recently published by the Department of Commerce make it possible to determine gross output, value added, and labor requirements of agriculture, food processing, and trade industries needed to produce final demand represented by civilian expenditures for farm foods in 1963. Estimates for the whole subsystem make it possible to relate changes in productivity to changes in food prices versus all consumer prices.

New Measures of Market Performance

A contract study is being developed to pilot test a proposed index of Consumer Satisfaction. This index is a statistical measure of changes in the perceived benefits that consumers derive from the consumption of goods and services, in relationship to changes in the prices of these goods and services. For the pilot study, investigation of consumer satisfaction will be restricted to a single standard metropolitan statistical area such as Detroit. A consumer survey of approximately 400 respondents will be structured to allow for differences in socio-economic backgrounds.

Capital Productivity

Work will begin on developing a data series for the quantity of capital services employed in food marketing to supplement currently available data for labor inputs. Substitution of capital inputs for labor inputs has been occurring for many years, but little is known about the productivity of capital in the food marketing system.

Price Spreads for Fruits and Vegetables

Refine and develop price spreads for specified processed fruits and vegetables.

Price Spreads for Bread

The Millers' National Federation is cooperating in a survey of firms producing bread-type flour on a test basis to assist in developing more accurate estimates of the millers' price spread for flour used in bread. Comparisons are

being made between these estimates and estimates based on secondary data now used. A determination will be made based on analysis of 12 months' data now available whether to continue the survey and substitute industry prices for prices developed from secondary data.

Poultry and Eggs

Work will focus on the relative changes which have occurred in geographic price spreads as a result of shifts in geographic sources of supplies and alternative marketing channels.

Livestock

An extensive mail survey of firms procuring meat for retail distribution will be made to determine the prices and volume of meats purchased as carcass, primal, sub-primal, and retail cuts. Using these data, coefficients will be developed for weighing published prices into composite prices of beef and pork as purchased by retailers.

Input Marketing

Efforts will continue to develop marketing margins for purchased inputs.

Problems

Continued increasing competition between cotton and manmade fibers causes difficulty in developing meaningful and useful information on marketing margins for cotton. Few consumer textile products are made from pure cotton, thus raising a question as to the validity of margins for cotton.

MAJOR SERVICE ACTIVITY

1. Regularly provided preliminary estimates of market basket statistics to the Staff Economists Group for submission to the Council of Economic Advisers.
2. Filled requests for price spread information made by congressional committees, trade groups, individuals, etc.
3. Answered congressional and White House correspondence concerning price-spreads, marketing charges, etc., for farm products.
4. Developed price spread information for inclusion in special reports, trade magazines, etc.

RESEARCH WORK UNITS

- | | |
|------------|--|
| 2-64-54-00 | Factors affecting spreads between farm and consumer prices for livestock |
| 2-73-54-00 | Costs, margins, and marketing channels in the poultry and egg industries |

3-90-54-00	Prices and margins for fruits and vegetables
3-99-54-00	Marketing margins for sweeteners, peanuts, and leaf tobacco
9-1-54-00	Marketing situation and outlook reports
9-2-54-00	Farm-retail spreads, marketing bill and related statistics
9-3-54-00	Measurement of aggregate economic relations in marketing foods
9-16-40-04-X1	Improving measures of market performance
9-16-54-00	Improving data collection and analysis on market performance
10-3-54-00	Price spreads, costs, and margins for grain and grain products
10-4-54-00	Marketing margins for fats and oils in selected consumer products

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MARKETING SYSTEMS PERFORMANCE ANALYSIS

SITUATION

The rapidly changing nature of the food and fiber complex has been documented and analyzed. The tendency is toward fewer but larger, more specialized and more capital-intensive firms and tighter vertical coordination among production and marketing activities.

Implications of these changes are crucial in planning and conducting research in marketing economics. As stages of the production marketing complex become more tightly coordinated vertically to form various systems and subsystems, the organization and performance in one part of the system are increasingly influenced by organization and performance in other parts of the system. For example, to understand and evaluate performance of today's commercial farm firms, it is necessary to understand the organization and behavior of firms supplying farm production inputs, those marketing farm commodities, and the manner in which each group relates to the farm sector. More comprehensive and systematic research is required now than ever before if we are to help answer pertinent questions. The broad problem is to devise and carry out research encompassing various systems and subsystems which will aid in understanding and improving performance in the food and fiber complex.

PROGRESS

Hog-Pork

This research was initiated to assess the probable nature of future vertical coordination in the hog-pork subsector and to determine the probable extent to which contract production and/or vertical integration through ownership might take over coordination of the hog industry as opposed to traditional markets. The work is being undertaken in a total systems context in order to ascertain not only the primary and secondary changes in resulting economic activity throughout the industry, but also to better understand the complexities of cause and effect relationships in the decision processes.

The research effort is focused on an industry model and a firm-oriented model. The function of the industry model is to simulate aggregate production-processing-consumer distribution activity of the industry over time showing resulting prices and output when one form of vertical coordination expands at the expense of the others. This shift in form of coordination is guided by the decision framework embodied in the model. The function of the firm-oriented model is twofold. One is to determine the optimal behavior of a profit maximizing set of production, processing, and marketing firms at a point in time, in light of the simulated industry prices at that time. The other function of the firm model is to estimate shifts in firm organization and profits in response to alternative forms of vertical coordination. After observing results at the firm level, selected forms of coordination can be introduced into the industry model and results tested at the industry level.

A third area of research designated as studies in competitive structure will focus on indepth analyses of the basic economic and psychological forces

which lead to the development of vertical coordination. This group will attempt to specify the effects of these alternative forces of coordination as they affect the coefficients and structure of both models.

The structure of the industry model has been specified and preliminary estimates of several of its structural components are now underway. Considerable effort was spent in locating and securing data from the Meat Inspection Division, C&MS, USDA, indicating hog slaughter plant capacity and from the Illinois Farm Records Association indicating differences in accounting data of firms who have expanded hog production vs. those who have either maintained or contracted their hog enterprise.

Data for the consumption, processing, and slaughter sections are being disaggregated by type of enterprise--e.g., pork cuts distributed through supermarkets, small retail outlets, various institutions, full-line packer or specialty processor. Development of the production section of the industry model is the responsibility of economists at Purdue and Michigan State working under cooperative agreements while the slaughter-processing and consumer distribution section is being developed in-house. Preliminary estimates of all components of the industry model are due February 1, 1971, in order that their integration into a computer program can be commenced.

The firm-oriented model is an extension of a slaughter-processing model already operational at Purdue. Pig production and hog finishing activities have been interfaced with the slaughter activities of the existing model.

Work is commencing to interface a set of consumer distribution activities with the final processing activities of the model. All work on the firm model is being done under cooperative agreement with Purdue. This firm model is expected to be operational late next year.

The competitive structure group has developed an extensive "questionnaire" designed to establish and define economic forces and attitudes of management where contracts or vertical integration has already replaced the market as a coordinative force. Thirty-to-forty industry leaders will be interviewed in November-December 1970. The competitive structure group has scheduled an industry symposium in the spring of 1971 where selected industry leaders will be invited to present their views on the direction of future coordination of the hog-pork industry. A hog-marketing "business game" has been developed to analyze buyer and seller strategy. Research in this area is the joint responsibility of economists at Michigan State and Purdue under cooperative agreement and in-house personnel of both MED and FPED.

Livestock

A systems model comprising three vertical levels of cattle production and marketing (cow-calf, feedlot, and packer) limited to one firm in a horizontal dimension is being developed to function in an operational environment characterized by pure competition, existing institutional and regulatory forces, and a profit maximization goal. Four of the subroutines are programmed while three are in flow-chart stage. A vertically integrated firm is cooperating to supply verification data. When the model is completed and verified, it will be used to simulate firm response to alternative levels of market information.

Potatoes

Work was continued on the national adjustment model encompassing the locational, seasonal, and product form dimensions of the U.S. potato industry. During the past year this work has consisted of modifying and improving demand estimates, developing new and more comprehensive data sources, and developing production response relationships for various potato production areas. This project also includes close cooperation with the Idaho Agricultural Experiment Station to determine expected demand, price, and cost relationships for fall-crop potatoes as the length of the storage season is increased. New data collected in one phase of the study support earlier preliminary conclusions that year round processing operations are feasible but that cost efficiency is not improved beyond a 9-10 month operating season. In a second phase it was found that fresh Idaho potatoes would probably continue to command a significant price premium in competition with late spring and summer supplies from other areas.

Rice

A marketing systems model of the rice industry was completed and tested in cooperation with the Purdue University staff. Initial analysis involved optimizing alternative locational and technological configurations of the domestic rice drying and milling industries. It involved the use of a non-linear programming model incorporating a vast amount of data pertaining to rice production, storage, milling and transportation costs, and patterns of market demand.

In addition, a policy analysis subsector model in cooperation with the University of Florida is being finalized. It is being developed to interface with the production response and marketing system model to provide an analytical tool for estimating the impact of alternative farm programs on producers in the entire marketing system and their likely cost to the Government.

Grain

A wheat quality evaluation program similar to the one for cotton is continuing in cooperation with ARS and Kansas State University. Research has been confined to evaluating the baking qualities of wheat in bread--the largest domestic market for hard wheats. The initial phase of this research program is developing faster than that for cotton.

A mathematical model involving linear programming has been developed for use in selecting wheats for maximum profit milling of flours having given specifications. Basic coefficients which relate significant wheat quality factors to milling performance, to flour quality, and to value of products have been selected for the model. This model has been tested and proven using a simulated problem. Samples of wheat were blended and milled according to the maximum profit solution determined by the model. The flour then was sent to a commercial laboratory and used to bake bread which was analyzed for customer acceptability. The solution generated by the model provided flour which produced acceptable loaves of bread. This research provides information useful to managers in increasing the efficiency (reducing costs) of the firms in processing and marketing wheat.

Wheat research indicates that (1) systems analysis, using linear programming as the method of solution, is technically feasible as a management tool for profit optimization of a specific grain industry problem and (2) systems analysis provides a procedure for responding to price and technology changes in such a manner as to have available for evaluation the optimal profit solution, as well as the price and quantity schedules necessary for supply and demand analysis of inputs and products incorporated within the framework of the model. Coefficients are being developed for building a model to aid in the evaluation of economic efficiency in wheat assembly, processing, and distribution. This larger model will allow computation and comparison of marginal value products both at the bakery and at final demand.

Wholesale Bakery

An empirical systems model of the baking industry was developed by exploring relationships of baking industry pricing, output, and net revenue for firms within a market area. Relationships representing selection of types of bread labeling, distribution outlets, production processes, and ingredient handling were estimated. When these relationships are integrated into a total systems model, it will provide a framework for experimentally analyzing effects of reallocating resources in the production and distribution of bread.

Spinning Plants--Textiles

Tentative systems models of textile spinning plants were refined to illustrate the versatility of their use and influence on reducing raw cotton and manufacturing costs and maximizing profits. The models combine multiple linear regression analysis with linear programming to give guidance in selecting from among cottons of varying prices and processing organizations of varying costs and levels of productivity.

During the past year regression coefficients derived in the pilot plant were modified for use in two commercial textile plants. A linear programming model was specified for each plant and an alternative raw cotton mix and processing organization were obtained from the model, based on availability and prices of raw cottons. These results were then checked in the pilot plant by comparing the mill mix and organization with the new mix and organization. One model was successful in all respects; the other was not, suggesting that the technical and cost coefficients used will require additional study, refinement, and analysis to determine the extent of variability in these coefficients that can be tolerated in the systems model.

Input-Output Analysis--Textiles

Input-output analysis was used as a method for studying textile industry problems. The 1958 input-output tables published by the U.S. Department of Commerce were updated. A report was prepared and published which described the input-output technique, developed and presented the table updating procedure, and provided an aggregate model of the U.S. economy for 1966.

A further extension of this input-output work involved the development of a method for generating income and employment multipliers for each sector of the

national economy in 1967. This methodology had never been used before on a national input-output table because the household sector could not be closed into the table.

Progress is being made in further disaggregating the textile manufacturing, warehousing, and transportation sectors of the 1967 input-output table based on the recently released input-output table for 1963 rather than the previous 1958 table.

Cotton

A systems model for raw cotton, patterned closely after the rice systems model is being developed. Current cost data on ginning and warehousing are available from continuing research, along with technical coefficients and costs for model gins. Research on model warehousing costs and specifications is nearing completion. Some technical processing coefficients are available and others are being developed in cooperation with ARS. It is not planned at this time to extend the model for raw cotton and textile manufacturing into the wholesaling and retailing subsectors.

Air Freight

Census data reflecting all U.S. exports and imports for 1967-69 have been analyzed. There was marked seasonality in air movements for eleven major agricultural commodities, and the seasonality differed from that for ocean vessel movements.

Data from more than 200 shippers of perishable agricultural commodities on their use of air and surface modes of transportation are being analyzed. Total distribution costs by alternate modes are being developed.

PLANS

Hog-Pork

Work planned for completion this next year includes (1) the completion of the industry mathematical model; (2) testing the individual relationships and overall coherence of the aggregate model; (3) collecting necessary data; and (4) preparing the preliminary reports on the structure of the present production-marketing systems in the subsector.

Assembly of data and running of regressions of individual demands by pork cut will be completed. These results of demand analysis will be incorporated in the pork consumption subsystem of the hog-pork subsector industry model.

Systems analysis in this commodity area will be initiated by defining a structural model of the industry and delineating project work areas. Work will likely commence in one or two of these work areas.

Poultry and Eggs

Using results from functional efficiency, pricing, and structural studies completed or underway, a program of subsector research in the poultry and egg industries will be initiated.

Oranges

A third generation simulation model is under construction. When this is completed, the performance of the orange industry will be evaluated from the points of view of various participants.

Rice

The rice industry model will be refined and current industry costs and practices will be incorporated to provide a basis for evaluating alternative programs and marketing policies for the rice industry.

Potatoes

Work during the coming year will focus more specifically on obtaining basic data needed in the adjustment model. Information regarding changes in organization and structure of the potato market will be obtained from a survey of potato processors and the results incorporated in the model.

Grain

The spatial model for wheat, feed grains, and oilseeds will be extended to a systems model incorporating costs for handling, storage, and distribution which are available from current research, and ultimately adding substitution feed grain coefficients and demand analysis being developed in cooperation with Purdue University and marginal value product values for wheat being developed in cooperation with Kansas State University and ARS.

Cotton

Plans call for further analysis of two firm models under commercial operations, plus extension of the linear programming spinning models to include multiple-yarn plants and the weaving process. The extension to weaving may prove to be a long-run endeavor, in view of the complexity of the weaving process and lack of clear-cut established specifications on fabric quality.

More complete specifications and costs on textile manufacturing and commodity flows and costs will be developed. These data will be incorporated in the raw cotton systems model for determining optimum size, type, and location of firms and marginal value products of various qualities of raw cotton at the processing level. Like the rice systems model, this technique will provide a means of evaluating alternative cotton programs.

Commercial Integration of Agriculture

A task force has been organized to inventory recent mergers and acquisitions and existing corporate entities operating in agriculture. A sample of such firms will be studied in detail to isolate and identify factors associated with changes and extensions of corporate activity. The purpose is to develop means for predicting and evaluating corporate involvement in agriculture.

Input-Output (Grain)

Develop and utilize the input-output approach as a means of quantitatively investigating the dynamic structure of the grain and grain processing sectors. Using the recent 1963 input-output table in conjunction with the 1967 Census of Manufacturers, a national input-output model will be constructed for 1967. This will provide for a significant industry level disaggregation (SIC-4 digit) of each grain producing and grain processing sector.

MAJOR SERVICE ACTIVITY

1. Consulted with representatives of the Canadian Government regarding systems research in Canada.
2. Analyzed with probable future demand for marketing services.
3. Evaluated conglomerate growth and factors accounting for the growth.
4. Evaluated program and administration of Matching Funds Marketing Services projects of USDA and State Departments of Agriculture
5. Provided Office of the Director, Science and Education, USDA, with estimates of current and 1968 costs for handling and storing cotton and for textile and apparel manufacturing both with and without increased research benefits.
6. Developed background information and evaluated the future market prospects for cotton.

RESEARCH WORK UNITS

- | | |
|-------------|--|
| 2-72-21-01 | Systems analysis of the broiler industry |
| 2-72-30-01 | Interrelationships between the poultry and egg industries and other sectors of the economy |
| 2-72-54-00 | Structure, practices, competition, management, and pricing in the poultry and egg industries |
| 2-81-15-01 | Vertical coordination in the hog industry |
| 2-83-40-01 | Measurement of market performance in the fluid milk industry |
| 2-87-15-01 | Systems analysis of economic activity in the hog-pork subsector |
| 2-87-23-01 | Systems analysis of economic activity in the hog-pork subsector |
| 2-87-54-00 | Systems analysis of economic activity in the hog-pork subsector |
| 2-88-54-00 | Systems analysis of economic activity in the beef subsector |
| 3-108-13-01 | Effects of interregional and interproduct competition on structure and performance of potato markets |

3-108-54-00	Effects of interregional and interproduct competition on structure and performance of potato markets
10-03-05-08	Grain price spreads, margins, and costs
10-08-38-01	An interregional analysis of the U.S. grain marketing industry
10-10-15-01-X2	Developing and testing a mathematical systems model of the U.S. rice industry
10-12-43-01	Marketing costs and margins for fibers and textiles
10-12-54-00	Marketing costs and margins for fibers and textiles
10-13-54-00	Appraisal of mixed feeds industry
10-19-10-01-X1	A model for evaluating alternative decisions for fibers, grains, and oilseeds
11-12-24-01-X1	Criteria for measuring performance of the orange industry
11-13-37-01	Market adjustments to changes in relative transport rates for feed grains and livestock products
11-16-05-01	Market performance in food processing industries
11-17-54-00	Potential air freight movement of perishables
11-18-54-00	Prices and supplies of processing and marketing services and implications for policy
11-19-10-01-X1	Simulation of the performance of the orange industry

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MARKET STRUCTURE AND COSTS

SITUATION

Research on structure is concerned with the organizational characteristics and practices of marketing firms which affect competition among firms and their relative bargaining position as both buyers and sellers. Studies relate to the measurement and evaluation of concentration, mergers and the various dimensions of integration and diversification of firms. These factors assist in evaluating the marketing position of power of the intermediary marketing agencies. Information on profit ratios and descriptive statistics relating to the farm-retail price spreads and the marketing bill serve as benchmark indicators of market position and power.

Research on the efficiency of performing the marketing functions evaluates the impacts of reduced costs and subsequent adjustments on farmers, marketing agencies and consumers. It relates to the adoption of new technology and innovations by marketing firms and its effect on costs of distributing farm products. In some cases, evaluation and alternative methods of performing the marketing functions are made possible through generating input-output coefficients which demonstrate least-cost methods of performing an individual function. Relationships are shown between costs and alternative methods (innovation and technology) or between costs and volume (economies of scale).

PROGRESS

Grains

Model rice drier specifications and costs were developed incorporating both flat and upright storage facilities. Length of storage, humidity, and moisture content of the rough rice are critical factors in storage selection and drier capacities and costs. The southern rice industry uses primarily the more expensive upright facilities while the California rice industry uses predominately flat storage.

Engineering data have been developed for three sizes of upright rice drying and storing facilities, and for a combination flat and upright facility. Machinery and equipment specifications and costs for rice milling have been completed for three size rice mills. Preliminary results indicate some economies of scale in both drying and milling, but the cost advantages of larger plants may be offset quickly by the increased inbound transportation costs of a larger operating area.

Current and projected 1970-71 costs for storing and handling grains were estimated. Increases in the costs of major inputs since 1967-68 will cause higher operating costs for all methods of handling grain in commercial elevators during the 1970-71 season. However, a projected higher average occupancy, 54 percent in 1970-71 compared to 42 in 1967-68, will nearly offset the influence of these increased costs on the per bushel cost of storing grain. Based on projections of cost and volume changes since the 1967-68 grain cost study, 1970-71 handling costs will increase over 20 percent while storage costs will increase only 2 percent. Estimated handling volume is nearly the same for 1970-71 and 1967-68 while the estimated stored volume is nearly 30 percent greater.

The 1970-71 combined cost for handling and storing grain at country elevators is 19.4 cents per bushel. This includes the cost of storage for 1 year plus the cost of receiving by truck and shipping by rail. Comparable cost was 18.3 cents in 1967-68.

Assuming a maximum storage capacity requirement of nearly 3.6 billion bushels and based on 1970-71 cost and volume estimates, but 1967-68 distribution patterns, estimated short-run storage and handling competitive rates were 3.5 cents per bushel for inland terminals. The comparable long-run competitive rate for inland terminals was 8.0 cents per bushel.

These data were used by ASCS and industry groups as the primary basis for establishing rates for Government-owned grains. A report which updates information in the 1968 survey of handling and storage requirements is being reviewed for publication.

Feed

A profit planning and control system has been developed to minimize feed manufacturers' costs by improving short-run decisionmaking in sales, manufacturing, product formulation, inventory, and feedstuff procurement. The main frame of the system is a linear programming model which simultaneously evaluates input data from the decisionmaking centers and generates optimum operating plans. The model was validated under commercial conditions by a medium-size firm. Minimum total savings of at least 84 cents per ton were reported over individual product formulation. The breakdown of savings according to functional areas was: Reduced ration costs, \$0.42; reduced labor, freight and demurrage expense, \$0.13; and reduced distributional expense and improved product pricing, \$0.29 per ton.

Cotton

The annual report on charges for cotton ginning, warehousing, and related services conducted in cooperation with the Consumer and Marketing Service showed a national average charge of \$19.15 per bale for the 1969-70 season, an increase of 51 cents per bale over the 1968-69 average. The average charge by State varied from \$14.09 per bale in Georgia to \$22.31 in California.

Charges for commercial storage averaged 63 cents per bale month, an increase of 5 cents per bale over the 1968-69 season average. Receiving charges averaged 97 cents per bale--an increase of 7 cents. Compression charges averaged \$2.08 for standard density and \$2.37 for high density, up 7 and 9 cents per bale, respectively.

Findings from a study of West Texas gins reveal increased utilization of capacity, higher volumes, and generally lower total unit costs in 1968-69 than in 1967-68. Increases in certain costs--labor, repairs, and some miscellaneous items--more than offset declines in power, management, and others, resulting in higher average out-of-pocket costs. This information is vital to ginning and related interests, particularly in this era of continually rising operating costs and generally declining ginning volumes. The 1968-69 study updates previous estimates of costs and includes an extension of rated capacity for single battery gins to 36 bales per hour and increases geographic coverage to the

entire Cotton Belt. These analyses provide information useful to operators contemplating remodeling an existing gin or building a new plant.

A comprehensive report summarizing the information on handling and storage costs for cotton in commercial warehouses was released. Increased costs of major inputs and reductions in stock available for storage have caused average storage cost to increase over 50 percent since 1964-65. Average cost for storage alone in 1968-69 was \$4.747 per bale per year (39.55 cents per month), compared with \$3.084 per year (25.70 cents per month) in 1964-65. Lower average occupancy of about 30 percent in both warehouses and compresses in 1968-69, compared with 70 and 55 percent, respectively, in 1964-65, was the major reason for higher costs. As a result, fixed cost per bale per month for storage in 1968-69 averaged nearly 13 cents per bale in compresses and 16 cents in warehouses, compared with averages of about 8 and 9 cents in 1964-65. Substantial increases were also noted in most variable cost items, but the increases were not as marked.

With a production of 12 million bales, the estimated peak storage requirement would be 9.6 million bales for the Belt as a whole. Under competitive conditions, with only enough space being operated to handle the peak volume, and facilities being utilized at 100 percent of capacity at the peak, monthly stock would average 70 percent of total capacity needed. Under these assumptions, it is estimated that the long-run competitive rate for storage only would be \$3.956 per bale year (33.0 cents per month). This rate would cover the total cost of the marginal firm, including depreciation and interest calculated on the basis of replacing all facilities at estimated 1970-71 price levels. While this rate would not return a profit to the marginal firm, all other firms remaining in operation would receive a profit. The short-run competitive rate for storage for all firms in 1970-71 averages \$3.180 per year (26.5 cents per month) and would range from \$2.926 per bale annually (24.4 cents per month) in the Southwest to \$4.821 per bale annually (40.2 cents per month) in the West. These rates would cover the out-of-pocket cost of the marginal firm and would be expected to provide an adequate amount of space to store the expected peak 1970-71 volume.

Peanuts

Handling and storage costs for 1969 crop farmers' stock peanuts were estimated for use by ASCS in establishing payment rates for these services. Average standardized costs for cleaning and drying ranged from \$2.231 per ton received for Southwest shellers to \$4.468 per ton received for Virginia-Carolina independent warehouses. Standardized receiving costs ranged from \$1.999 per ton for Virginia-Carolina shellers to \$4.192 per ton for Southeast independent warehouses. Load-out costs varied from \$1.198 per ton for Virginia-Carolina shellers to \$1.965 per ton for Southeast warehouses. Standardized storage costs ranged from 57 cents per ton month for Virginia-Carolina shellers to \$1.569 per month for Virginia-Carolina warehouses.

Dairy

Changes in the market structure of milk producer groups, processors, and food retailing have markedly influenced the buyer-seller relationships in milk marketing. Retailer groups are contracting for packaged milk through central buying programs, merchandising private label brands of milk, and expanding their

own processing facilities. These programs bypass the arrangements which formerly existed between the individual retail store and a local fluid milk processor and substantially improve the bargaining position of the retailer relative to that of the fluid milk processor.

Several approaches are being used to determine the importance of various factors influencing chain retailers' attitudes and responses toward milk procurement and processing programs. These programs, viewed as solutions of cost and procurement problems by some retailers, bring critical pressure upon processors and producer cooperatives.

An estimated 14 percent of all fluid milk products sold through stores in the North Central Region was packaged in plants owned by food retailers. This was about 9 percent of all fluid products sold in the area. Voluntary and cooperative group wholesalers supplied milk on a centralized basis to 70 percent of the supermarkets and 58 percent of the other stores affiliated with them.

Analysis of the changing supply and utilization of milk in the Northeast points up the different supply-demand conditions and the varying impact upon the separate markets. Changes in the production, in the level of milk production, and the relative production of different areas result in marked adjustments in the utilization of milk in different products, and in changing marketing patterns.

Analysis of the changing relationships assumes that major adjustments result from conscious and interrelated decisions rather than from random or unrelated fluctuations. Identification and measurement of these relationships can increase the probability of making proper adjustments, and hence improve efficiency in the production-marketing complex and in the allocation of resources.

Collective bargaining between labor unions and processors is a major institutional factor in the fluid milk industry. Actual bargained provisions in 40 markets are being used to evaluate the effects of collective bargaining upon structure, conduct and performance in terms of relative costs or margins under varying provisions.

Poultry and Eggs

A modified transportation model was utilized to evaluate alternative systems of distributing eggs from packing points to retail stores. Assuming similar locations, a channel in which a food chain has integrated into egg packing has no significant distribution cost advantages over a channel in which an independent packer sells and delivers to a large food chain, if there is a sufficient time period of trading relationship between the firms.

Studies of egg size and egg shell damage suggest extra large and jumbo eggs have more damage. Damage is also related to handling practices and age of laying flocks.

A modified linear transportation model was used to determine optimum sizes and locations for shell egg packing plants in Northern New England.

Minimization of assembly, packing, and distribution costs would result in eight plants located at points in Maine and Massachusetts.

A study was made of changes in plant and firm size in broiler and turkey processing. Medium to large broiler plants more than doubled in number from 1962 to 1968, with the main shifts in the South. Decreases in turkey plants were mostly in the small sizes, but number and sizes of large plants increased. Concentration in turkey processing (fewer firms) increased during the 1960's, but there was little change in broiler processing from 1964 to 1968. C&MS Commercial Egg Movement Report data showed commercial egg packing plants becoming fewer and larger during the 1960's.

A multi-period linear programming model was developed to investigate impact of alternative decisions and coordinating devices on performance of a total firm system for producing, supplying inputs, and marketing turkeys.

A major report on the market egg industry provided many new details on structure and performance in production, input-supplying and marketing.

Livestock

Data on marketings and costs by species and function for 10,000 marketing agencies from annual reports filed with the Packers and Stockyards Administration are being summarized separately by function for auctions, large and small dealers, terminal markets and commission firms.

Vegetables

Handbooks of input-output data for canning, freezing, and fresh packing vegetables in the South were compiled. Based on these, studies of economies of size for canning and freezing vegetables were completed. Results of a study on canning green beans indicate profitable investments in green bean processing plants at rates of 100 and 400 cases per hour at a finished product price of \$3.50 per case, raw product price of \$100 per ton, and seasons of over 1,000 hours. A comparable analysis showed that cost-revenue relationships at current raw and finished product prices for canning lima beans and leafy greens yield favorable investment values if rate of output was 400 or more cases per hour and length of season was 500 or more hours. Canning southern peas was not profitable at current prices except for the largest plants operating 700 hours per season. These data have been widely used in feasibility studies to determine the profitability of vegetable processing in specified areas.

A mixed-integer programming model has been developed to select optimal investments, in vegetable canning plants, for maximizing a firm's growth in net worth over a planning horizon. Preliminary results show the average annual growth rate for a corporate firm ranged from 15.5 to 20.7 percent under conditions of varying levels of initial capital, factor supplies and prices, product demand, and dividends to stockholders. Use of the model is limited only by complexity of problem analyzed.

The results of this study will be useful to firms considering the feasibility of investing in vegetable canning in South Carolina's Coastal Plains. The model itself can be modified for application in other geographic areas.

Woody Ornamentals

Average sales of landscaping plants and related items by retail outlet in eight Southern States averaged \$107,000 per firm in 1967. Sales by garden centers averaged \$220,000 and those sales by yards and landscapers averaged \$88,000. Sales of woody ornamental plants comprised 40 percent of total receipts of all firms--varying from 63 percent for landscapers to 17 percent for garden centers. The bulk of the sales of garden centers consists of fertilizer, lawn mowers and garden tools. This work was conducted under the Southern Regional Research Project, SM-33, in cooperation with eight Southern States.

Flowers

A nationwide study has been undertaken to determine the structure and practices of shipping point and terminal wholesale markets for cut flowers and potted plants. Sixty-two firms that ship a minimum of \$10,000 worth of flowers out-of-State have been interviewed in California, Colorado, and Florida. Cornell and Purdue Universities are cooperating with ERS on the terminal market phase of the study. Approximately 150 wholesalers of flowers are being interviewed in 13 major U.S. markets.

Farm Inputs

From 1958-65, elevators in Nebraska diversified in terms of the numbers of farm input product lines handled and in the proportion of total sales accounted for by products or services other than grain sales or storage charges. The average of nongrain sales to total firm sales increased from 23 to 29 percent, a 28 percent gain in the extent of diversification. The average number of services and activities increased by 15 percent. These trends appear to be continuing.

In a study of feed prices, high intercorrelation among independent variables made it difficult to interpret price differences reported by farmers for specified feed items. For premixed feeds the variables most consistently having significant regression coefficients were: brand, percent protein, bulk purchase, form of feed (meal, pellets, etc.), size of farmer purchasers' operation. Regionality was important for dairy feeds but not for beef, hogs or poultry feeds.

In estimates of demand for fertilizer, crop prices appeared to influence only fall fertilizer purchases, particularly of nitrogen and phosphate. Price elasticities of demand varied substantially between spring and fall for nitrogen and phosphate fertilizers but not for potash.

PLANS

Grain

The annual updating of handling and storage costs for grain and rice will be done as may be required to assist with administrative and policy decisions.

Cotton

Studies of ginning costs will be continued in West Texas and will be expanded to the Lower Rio Grande Valley and Blacklands areas using the mail-in

approach developed in the West Texas study. Data will be collected initially in these new areas for the 1970 crop year. This expansion was requested by the Texas Ginners Association, which has agreed to promote industry cooperation and, if needed, to assist in collection of data.

The annual report of charges for ginning cotton developed in cooperation with the Consumer and Marketing Service will continue to be reported for selected areas and handling and storage cost will be updated as required for policy decisions.

Dairy

Evaluation of changing structural relationships will be broadened to stress industry interrelationships. Partial analysis will continue to be a vital part of the research program, but coordination of these efforts should provide a more meaningful measure of specific changes upon the total dairy industry.

Evaluating changes and potential alternatives will relate local, inter-market, interregional and interproduct effects, taking into consideration the influence of production shifts, demand differences, and institutional arrangements or constraints in procurement, processing and distribution of the different dairy products.

Poultry and Eggs

Reports will be published on structure and costs in the egg products and broiler industries, while similar reports on the turkey industry will be developed. The preceding reports, as well as unpublished marketing research on the egg industry will be used as an important input for developing subsector models.

Vegetables

A new Southern Regional Project will be initiated which will analyze the locational structure for the region's vegetable packing and processing facilities and the spatial distribution of final fresh and processed products. This work is a logical extension of, and will make use of, the input-output data and capacity data that have been developed.

Rice

Representatives of the rice industry have requested that rice distribution studies be made annually. Because rice is one of the very few carbohydrate foods showing an increase in per capita consumption, distribution data are important to the industry in adjusting to these changes. A rice systems model will utilize these data analyzing the effect of certain factors on the industry.

Flowers

Work on woody ornamentals has been phased out and resources shifted to the study of terminal wholesale markets for cut flowers and potted plants. Data from the shipping-point and wholesale market surveys are being tabulated and analyzed. Findings will be published during the coming year.

Feed

An updating will be made of earlier work relating to costs and efficiencies in feed manufacturing. The study will be modified to include several smaller and specialized types of feed manufacturing facilities. Updating changes will reflect increases in input costs and increased efficiency. These costs will provide some of the basic input data for a total systems analysis of the grains-feeds-milling complex.

Farm Inputs

Study and analysis of the location of farm machinery retailers in California and agricultural chemical retailers in Michigan will be continued at about the same level in 1971.

Transportation

Research to estimate efficiencies achievable for rural areas through price and ownership coordination of the several transport modes will be initiated.

MAJOR SERVICE ACTIVITY

1. Evaluated small business loan applications from integrated egg and poultry enterprises.
2. Briefed foreign visitors on changes in structure, practices, and competitive developments in egg, poultry, dairy, and livestock industries.
3. Filled requests from trade and research groups on industry trends and changes.
4. Participated in the Department's marketing guide programs for eggs, broilers, and turkeys.
5. Analyzed cost of handling and storing cotton and grains of ASCS.
6. Discussed with foreign visitors marketing cost and structure for selected segments of the fibers and grains industries.
7. Provided the Bureau of Indian Affairs with an evaluation of the feasibility of establishing an alfalfa dehydrating plant on the Colorado River Indian Reservation at Parker, Arizona.
8. Evaluated the feasibility of establishing vegetable processing plants in various locations throughout the United States.
9. Consulted with ASCS personnel and provided data on costs of storing and handling peanuts and tobacco.
10. Participated in planning and conduct of flower industry workshop.
11. Assisted foreign visitors seeking to understand particular aspects of structure and performance of soybean, feed, farm machinery, and other agricultural industries.

12. At request of Congressman Hamilton, conducted a feasibility study on the establishment of a tomato processing plant in Ripley County, Indiana.

RESEARCH WORK UNITS

2-57-54-00	Efficiency in managing market milk supplies
2-61-15-01	Improving efficiency of turkey production input-supplying and marketing
2-61-23-01	Efficiency in distributing eggs and poultry
2-61-24-01	Improving efficiency of egg, poultry, and production input marketing in the Midwest
2-61-30-01	Improving efficiency of egg, poultry, and production input marketing in the Northeast
2-61-54-00	Improving efficiency of egg, poultry, and production input marketing
2-65-14-01	Market structure and competitive behavior in the dairy industry
2-65-54-00	Market structure and competitive behavior in the dairy industry
2-72-54-00	Structure, practices, competition, management, and pricing in the poultry and egg industries
2-76-54-00	A study of the licenses, fees, and sanitation inspection costs paid by the dairy industry
2-79-15-01	Market structure and competitive behavior in the dairy industry
3-109-10-01	Factors affecting firm growth--An application of computer simulation to a vegetable canning firm
3-110-15-01-X1	Organization, practices, and structure of Midwestern wholesale markets for flowers
3-110-17-01-X1	Organization, practices, and structure of shipping point markets for flowers
3-110-33-01-X1	Organization, practices, and structure of Eastern wholesale markets for flowers
3-110-54-00	Organization, practices, and structure of wholesale markets for flowers
10-5-03-01	Cotton ginning efficiency and cost in the Western Cotton Belt
10-5-25-05	Cotton ginning efficiency and cost in the Central Cotton Belt
10-10-03-01	Cost of handling and storing grains, fibers, oilseeds, and their products in the West

10-10-25-05	Economics of handling, storing, and processing grains, fibers, rice, oilseeds, and their byproducts
10-10-54-00	Economics of handling, storing, and processing grains, fibers, rice, oilseeds, and their byproducts
10-12-25-05	Marketing costs and margins for fibers and textiles
10-13-15-01	Appraisal of mixed feeds industry
10-13-54-00	Appraisal of mixed feeds industry
11-8-54-00	Effect of transportation structure on the South's grain marketing structure
11-9-15-01	Changing structure and performance of the agricultural input industries
11-9-28-01	Potentials for restructuring retail markets for farm inputs
11-9-54-00	Changing structure and performance of the agricultural input industries
11-10-15-01	Market dimensions affecting market demand, conduct and performance for farm inputs
11-20-05-08	Optimum location of farm machinery retailers in California
11-20-23-01	Optimum location of agricultural chemical retailers in Michigan

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IMPROVED PRICING SYSTEMS

SITUATION

Economic and technical integration, i.e., the splicing together of several sequential functions, is becoming increasingly significant in modern marketing and production activities. Previously well-defined, physically active markets are being by- or over-passed by the emerging architecture of marketing spans linking producers and consumers. Even where intermediate markets continue to exist and function, economic participation is at a lower level because an increasingly larger proportion of supplies formerly passing through them are siphoned through semi-closed sectors of distribution that are the direct creations of integration.

In these semi-closed sectors, conventional or open market price determinants are subordinated or vanish and the assignment of value to products at various operational stages becomes higher mechanistic. Important implications are evident. Because certain market prices reported to the public are based upon a decreasing proportion of marketed supplies, there is some question regarding their usefulness to buyers, sellers, and policymakers in decision-making. But something requiring more fundamental consideration is the loss of price as an allocative mechanism in certain economic sectors. Research is needed to determine the impacts of integration on price determination, consequences, and possibilities of forging suitably efficient alternative allocative guidelines within the context of free enterprise.

There is considerable concern about the role of grades and standards in the marketing system. The role of grades and standards is to facilitate an efficient pricing system for agricultural commodities. An important concern is how well the marketing system maintains quality and reflects product differences in both industrial and consumer markets at different levels of trade. There is need to integrate conceptual theory and statistical methods into an organized body of knowledge suitable for continuous use in evaluating the adequacy and needs for grades and standards. There is need to compare volume of commodities available by grade with volume of commodities demanded by grade.

PROGRESS

Pricing

Eggs

Egg pricing studies carried out during the last few years by ERS, C&MS, and 13 State agricultural experiment stations under special funds provided by Congress have been completed. Most of the results have been published.

Major reports published during FY 1970 discuss short run price predictive models and intermarket price relationships (Georgia, Ohio, New Hampshire, Cornell, and ERS) alternative egg pricing systems (Purdue, Ohio, New Hampshire, ERS) and improvements in base price quotations and their use through better market information (ERS, Georgia, Penn. State). An analysis was made of the characteristics and performance of agricultural and nonagricultural pricing systems and of the needs for pricing systems research on commodities other than eggs.

Other reports in process include: price predictive models for the Northeast (Penn. State, New Hampshire); cash-futures price relationships (Michigan, Illinois); wholesale-retail price relationships (Rutgers); the role of uncommitted supplies in price determination (Maryland); State-Federal quality and weight standards, price and volume reports, and weekly retail sales in relation to egg prices (Missouri); and bargaining between retailers and their egg suppliers (ERS). A book of readings on egg pricing is in preparation which will contain technical and semi-popular articles from studies related to the egg pricing research program.

The National Egg Pricing Systems Study Committee, consisting of representatives from 10 trade groups and NASDA and USDA members, held nine meetings during the year. Its report, issued on May 20, 1970, was approved at an industry meeting in June 1970. The Committee was directed to remain active in FY 1971 to develop plans to implement the recommendations contained in its first report for improved egg pricing. Private organizations and the USDA Market News Service have already initiated some of the information program improvements suggested in research studies and in the NEPSSC report.

A preliminary analysis of futures trading in fresh egg contracts suggested deliveries were made to market surplus eggs and to affect cash market prices. An indepth study to improve the contract and market performance was suggested.

Studies suggested that variations among State and U.S. standards on air cell size and weight complicate packing and marketing, possibly confuse consumers, and make geographic price comparisons difficult. Public agencies and trade groups have used these analyses in seeking legislation to achieve greater uniformity in standards as an aid to better price practices.

Poultry

Three alternative forecast models were developed which make monthly forecasts of broiler prices and quantities for the eight succeeding months. The demand equation used was based on earlier work, but in the supply equations tested, promising results were obtained by the inclusion of variables for technological change and short-run capital accumulation.

Dairy

The Federal Order program sets minimum price to farmers for nearly four-fifths of all fluid grade milk sold to plants and dealers. These prices must maintain certain relationships of price alignment and differentials between markets and products if stability is to be maintained.

In order to provide more meaningful measures of response, economic and statistical models using cross-sectional and time series data were used to develop estimates describing regional demand parameters for milk. Results of three models indicate differences in the levels, the price elasticities, and income elasticities of regional retail whole milk demand functions.

Regional retail price elasticities varied from completely inelastic to a $-.70$. The price elasticity of demand was within the range of $-.15$ to $-.30$ for the United States.

Livestock

Communication theory was used to develop a conceptual basis for examining the effectiveness of information patterns in the beef marketing system. Barriers to effective communication within the beef marketing system were identified and related to observed inefficiencies in the marketing process. Possible changes were suggested in the beef marketing system and related services, such as grading and market news, which would improve the effectiveness of communication in the system. A behavioral model of cattle and hog monthly supplies and demands was constructed and estimated via two-stage least squares at the live animal level. Monthly demand fluctuations, income and population changes, and the slaughter supply per packer workday were found to affect cattle and hog prices. Marketing behavior by farmers was affected by feedlot inventories and the recent price changes which apparently influenced their short-run price expectations and subsequent marketing response. Short-run prediction equations were also developed to look at the price and supply picture, by month, up to six months in the future.

A manuscript describing the results of an analysis of the monthly supply, demand, and price variations for selected wholesale beef and pork cuts is now in progress. An 18-equation structural model for beef and pork cuts incorporating the live and wholesale levels was analyzed. The forecastability of the wholesale prices over a short-run period was also assessed.

A pilot project demonstrated that covariance analysis using dummy variables is a useful tool for quantifying price differentials for livestock based on market form and quality. This pilot analysis indicated that in the case of Colorado cattle markets, prices were higher for lots of ten or more cattle, prices varied significantly between auction markets in certain months, and price differences were significant for class of cattle. Feeder steer prices were \$3.18 per cwt. higher for calves weighing less than 500 pounds than for 500-600 pound calves, and feeder heifer prices averaged \$4.04 less than feeder steer prices.

Potatoes

Work was completed on the development of a conceptual framework and analytical approach for objective measurement and evaluation of price performance in agricultural markets. This method of analysis was specifically applied to an evaluation of performance in the Red River Valley potato market. A major hypothesis tested in this analysis was that large sellers received higher prices than small sellers. The measured price results completely refuted that hypothesis. Not only did small sellers receive higher prices on the average, but this was a consistent pattern for 8 of the 9 months included in the analysis. It was also found that chainstores paid slightly higher prices than other types of customers. This price difference was too small to be considered important by the firms involved. However, this result did refute the often heard assertion that chains use their "market power" to drive down prices in this market.

Vegetables

A two-stage multivariate regression approach was used to analyze Wisconsin processor contracts for 1968. The measured results show that 95 percent of the price variation in sweet corn contracts was related to differences in contract provisions. The comparable figure for green pea contracts was 83 percent. These results indicate that canners compete for raw product supplies by changing contract provisions rather than varying the net base price. The net prices to farmers were about the same regardless of which of the various contracts they signed.

Corn

An evaluation of the effects of field shelling of corn on seasonal marketing patterns, price discounts to farmers at harvest time, and seasonal price patterns is nearing completion. This study, in cooperation with Purdue University, will analyze the effect of possible changes in the length of the harvest season on the commercial storage industry in the Midwest.

Also included will be an examination of the size and location of driers and storage facilities needed to optimize the handling of field shelled corn.

Grain

A price prediction model for corn, wheat, and soybeans has been developed and is being tested. The coefficients are being estimated using simultaneous equations and a distributed lag analysis. Estimated prices will be coupled with existing storage cost estimates in a simulation analysis to evaluate the impact and/or alternatives of expanding grain storage in the Southeast.

Feedstuffs

An analysis of feedstuffs pricing and utilization, in cooperation with Purdue University, is developing use-profiles for selected feedstuffs and a model specified to predict the demand for feedstuff nutrients. An analysis of the temporal-class-weight-geographic distribution of livestock on feed will be combined with recently developed cost information to model the farmer-feed mill subsector incorporating locational differences, supply and demand coefficients, and prices. These analyses will assist feed and livestock industry leaders and public officials to better understand the interrelationships of factors affecting feedstuffs pricing and utilization.

Farm Bargaining

To test results of implementing a bargaining board in a commodity system, alternative bargaining board policies were simulated in the western late potato system in 1980. Results obtained imply that establishing a bargaining board in the western late potato system could result in higher gross returns per unit of potatoes produced compared to the current system. Certain of the tested policies were preferable for western late potato producers. Gains would be associated with restricting resource use in the system. For some commodity systems, bargaining boards offer a policy tool which could lead to gains limited by the supply and demand characteristics of the particular commodity system.

Futures Trading

Procedures for making cross commodity comparisons of the potential gains to agricultural producers from futures trading have been developed. These procedures, employing regression analysis and computer simulation, take into account both the benefits from shifting price risks and the benefits from basing short-run production decisions upon futures price quotations. Representative cattle feeding and hog finishing operations at several locations throughout the U.S. have been selected for analysis. Assembly and processing data on prices, production costs and marketing costs have been initiated.

A study was started to evaluate the bearing of information quality on behavior of futures prices. Preliminary study shows estimates of corn production were consistently under actual production during 1956-62, whereas estimates of soybean production were consistently over actual production during 1962-68. The presumption is that these and other information errors have effects on futures price movements, which effects might be analyzed by statistical means. Data have been assembled for this purpose.

Several new studies were initiated under contracts or agreements. For shell eggs and frozen pork bellies, econometric analysis of quarterly, monthly, and weekly price movements have the objective of developing models that will aid in identifying short-run futures price aberrations.

Also for eggs, studies were initiated to determine the nature and significance of the extensive deliveries on futures contracts, and to analyze the potential benefits and limitations of alternative contract specifications.

For onions, econometric analyses will be made to delineate the effects of futures trading, during its decade of existence, on price stability.

For cattle, simulation analyses are to be made to determine the potential impact of futures trading in live cattle on the organization of cattle feeding.

Finally, a study was initiated to describe the range of services being provided for the conduct of futures trading and to explore ways in which their bearing on futures trading performance might be evaluated.

Transportation

Evaluation of pricing processes guiding purchase and utilization of freight cars showed considerable divergence from optimal processes. They were deficient prior to 1964 in that prices were held at too low levels for adequate investments in fleets. The flat prices also gave no incentive to the railroads originating interchange traffic to upgrade the quality of the fleets. Stable prices seasonally then and up to 1970 gave no incentive to railroads to allocate cars to areas having the most pressing seasonal demands, a condition particularly detrimental to the interests of agricultural and lumber shippers.

Grades and Standards

Cotton

Various studies which involved other agencies of USDA were conducted in connection with the ARS Pilot Spinning Laboratory. These were varied in nature--some pertaining to harvesting practices, some to ginning practices, and some to mill processing. A study of lint color and trash, as affected by field exposure, indicated that trash unduly affected the background color of lint, which is not highly correlated with spinning performance or with yarn quality. This showed that lint color as a pricing factor should be reduced. A study of stripping southeastern cotton showed clearly that unsatisfactory spinning results can be expected from stripping cotton in this area. The results can also be applied to the mid-south, where growing conditions are similar. A ginning study showed that the addition of moisture to seed cotton just prior to the seed separation process greatly improved lint characteristics and spinning quality.

A pilot plant study of lint cleaners in gins showed that two lint cleaners operated split-stream with twice the combing ratio can produce lint with grades equivalent to those of lint processed through two lint cleaners in series at conventional operating speeds. No significant increase in fiber damage occurs over that caused by one lint cleaner in conventional operations.

A study of mill processing showed that both tensor settings on the spinning frame and percentage of noils removed during combing significantly affected processing results.

Additional studies of fiber quality, as related to mill processing and product quality, were made to refine existing statistical relationships. The mill processing studies, in particular, are useful to textile manufacturing firms in selecting and processing cotton. They also provide necessary inputs for the cotton systems model.

A survey of 1967-68 cotton usage by 32 of the largest textile manufacturers indicates a significant trend toward the use of synthetics in blends in the coarser cloth construction. The amount of cotton blended with polyester more than doubled from 1965 to 1968, but the most used proportion of manmade fiber to cotton, formerly 65 to 35, came down to 55, with an appreciable proportion as low as 25 to 35 percent manmade fiber. No appreciable change in cotton quality requirements for the finer fabric was detected.

Commercial mills make use of these results as a norm against which to compare their own operation. Also, producer groups, merchants, the Commodity Credit Corporation, and mill buyers use the information to indicate significant trends in fiber usage and in cotton quality used in various end products.

Grapefruit

A study of the influence on sales of different grading systems and pricing differentials between grades for Texas grapefruit has been completed. The findings revealed that the elasticity of demand for Texas grapefruit was about the same in Dallas, Texas; and Kansas City, Missouri, -1.25 and -1.24 respectively.

No significant difference was found in sales in Dallas where consumers were familiar with Texas grapefruit, whether grapefruit were offered for sales as U.S. No. 1 Grade or U.S. Combination (60% U.S. No. 1 and 40% No. 2). In Kansas City, sales of test fruit were 28 percent greater when graded to the U.S. No. 1 Standard than the Combination. These findings indicate that grading to closer tolerance is important in market development activities designed to regain old markets or develop new markets where strong competition is present.

PLANS

Poultry and Eggs

Continuing work on egg pricing will involve implementation of research and National Egg Pricing Systems Study Committee recommendations. This will include improvements in USDA market information programs and testing of short-run price predictive models for regular use to obtain guidelines. Previous work on eggs, broilers, and turkeys will be used as a starting point for expansion toward subsector models. Studies on egg futures trading and contracts will be conducted in cooperation with the Commodity Exchange Authority and the Missouri and Michigan Stations.

Livestock

Research will be conducted to disaggregate intertemporal prices of slaughter cattle and hogs at Minnesota-Iowa markets into supply and demand components associated with the intertemporal wholesale price level and those associated with the market form used to determine the short and long-run slaughter cattle market adjustments between each market form and to investigate the consequences of this adjustment mechanism in the Minnesota-Iowa area. The systems model of simulating information feedback at the firm level will first be used to reproduce information flow under the current structure.

Onions

Work is underway to describe and evaluate the price effects of futures trading in the onion market. Prices will be analyzed at the farm, shipping point, wholesale, and retail levels to determine the effects of structural change during the period from 1930 to the present. The beginning and then ending of futures trading was the major structural change during this period.

Grain

Simulation analysis of the impact of and/or alternatives for expanding grain storage facilities in the Southeast will be expanded to evaluate alternative acquisition, storage, and distribution possibilities for grain and to estimate changes in costs and revenues associated with possible changes in acquisition, storage and distribution methods, technological improvements, and capacity utilization.

Cotton

To continue to cooperate with ARS and other agencies in conducting the research program of the Pilot Spinning Laboratory at Clemson, South Carolina.

Plans are to continue annual surveys of cotton usage in textile manufacturing through mail questionnaires to a reduced number of firms.

Farmer Bargaining

Publications on farm bargaining boards will be prepared for joint release with university cooperators. A technical publication will emphasize the technique of analysis and the results obtained. A popular publication will emphasize the policy aspects of the research. Also, a technical article based partly on this research will be prepared.

Futures Trading

The study of hedging potentials for live cattle and hogs should be completed and in manuscript near the end of the coming year. The study of facilitating services also should be completed. It is anticipated that findings from each of these will facilitate planning of new related studies during the year.

Another study to be initiated in the coming year will measure the aggregate movements of futures trading activity in agricultural products, over several decades, and explore the meaning of the observed patterns in terms of economic forces.

Transportation

A new series of ocean freight rate indexes will be published, and the several rail freight rate indexes will be put on the new base period designated by the Office of Management and Budget.

MAJOR SERVICE ACTIVITY

1. Reviewed C&MS recommendations of Departmental position on transportation rate and service proposals.
2. Analyzed the impact of threatened rail strikes on agriculture and consumers and discussed with other interested agencies.
3. Evaluated rail line abandonments and freight rates as these affect rural areas.
4. Developed estimates of 1970 production, use and transportation of Midwest feed grains for use by Administrator in a conference on feed grain transportation problems.
5. Participated in several potato industry conferences and workshops.
6. Worked with trade groups and USDA market news service on improvements in pricing and market information on eggs.
7. Worked with the Commodity Exchange Authority on cash egg trading and futures prices.

8. Furnished information on livestock pricing to Department officials and congressional committees.
9. Probable prices and domestic production of livestock and beef imports were simulated over the 1970-72 period for Department officials and members of the Council of Economic Advisors.

RESEARCH WORK UNITS

2-55-26-01	Egg pricing
2-55-30-01	Egg pricing
2-55-31-01-X1	Egg pricing
2-55-40-01	Egg pricing
2-55-40-01-X1	Egg pricing
2-67-23-01	Pricing and market information systems in the livestock meat economy
2-67-24-01	Pricing and market information systems in the livestock meat economy
2-67-38-01	Pricing and market information systems in the livestock meat economy
2-67-54-00	Pricing and market information systems in the livestock meat economy
2-72-23-01-X1	Egg futures
2-72-26-01-X1	Egg futures
2-72-54-00	Structure, practices, competition, management, and pricing in the poultry and egg industries
2-75-16-01	Futures markets and contract pricing in the livestock meat industry
2-85-40-01	Marketing nonfed beef
3-113-52-01-X1	A price analysis of the onion market
10-15-01-X1	Impact of field shelled corn on marketing price patterns and commercial processing facilities
10-11-43-01	Price-quality relationships for cotton
10-17-17-01	Quality evaluation of wheat and processing and distribution optimization of wheat products

10-18-49-01	Impact of expanded storage facilities for grain in the Southeast on prices and returns to producers and handlers
10-20-15-01	An economic analysis of feedstuffs pricing and utilization
11-1-54-00	Economic evaluation of grades and standards used in agricultural marketing
11-2-46-01-X1	Design of a truck freight rate collection scheme
11-2-54-00	Freight rate indexes and transportation costs
11-11-39-01	Potential contributions of national farmer bargaining boards to farmer bargaining power
11-14-52-01	The dynamics of futures markets
11-15-05-01-X1	Application of agricultural marketing boards to U.S. agriculture
11-21-14-03-X1	Facilitating services for futures trading
11-21-23-01-X1	Effects of futures trading on the structure of the cattle industry
11-21-46-12-X1	Analysis of short-term cash and futures price movements for pork bellies and shell eggs
11-21-54-00	Potentials for futures trading in perishables and semi-perishables

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COMPETITIVE INTERRELATIONSHIPS IN AGRICULTURE

SITUATION

There is continuing competition among products and among regions that constitute important forces of change in both production and marketing. New technology often has a differential impact among regions and upon firms within a region. Even though new technology may be equally available to all, physical and institutional restraints often prevent adoption or limit the benefits to be derived. For example, small acreages of cotton per farm severely limited the adoption of fully mechanized cotton production in the Southeast. Likewise, the adoption of mechanical harvesting of tobacco is likely to be delayed by the small size of tobacco allotments attributable to Government supply control programs. But when economic and institutional conditions permit, the introduction of new technology can dramatically alter competitive interrelationships at least in the short run, as in the production and processing of tomatoes.

Similarly, new technology which alters production-marketing cost relationships in one region relative to others may bring about short-run changes in competitive positions. Many relationships may be altered by differential changes in costs of production inputs, such as labor and taxes or changes in laws or regulations.

Changes in transportation regulations, technology, and costs can have significant effects upon competitive interrelationships among regions. Possible changes in such variables should be carefully and systematically explored with respect to their impact upon location and efficiency of production and marketing.

The subject of interregional competition has received only sporadic research attention through the years. Typically, such studies have considered only a few factors such as transportation costs or plant efficiencies and have had little positive predictive value. In seeking to determine a least-cost distribution of production, little consideration has been given to the restraints imposed by forces external to production units or to the implications of the projected changes on the farm input and marketing sectors. Firms involved in the manufacture and distribution of farm supplies, for example, are vitally interested in projected changes in the number and size of farms and must depend to a considerable extent upon both Federal and State research in this area. Processing and marketing firms, as well as farmers' cooperatives, likewise need such economic intelligence as a basis for long-range planning.

PROGRESS

Poultry and Eggs

Major changes have occurred in structure, practices, and location in the market egg industry in the last two decades, with the Midwest declining and the South and Pacific Coast increasing in importance. Factors generating changes include: (1) concentration of production, input-supplying, and marketing into fewer and larger units; (2) increased efficiency of operations; (3) shorter and more direct marketing channels; (4) improved egg quality; (5) relative

returns from other agricultural enterprises; and (6) employment opportunities and wage rates in nonagricultural enterprises.

Many of the preceding forces will continue and intensify in the 1970's. In addition, the egg industry will experience enhanced producer bargaining power, and face growing concerns over health, nutritional, and environmental dimensions. A special analysis made for Eastern egg cooperatives suggested ways in which they can work together to strengthen their competitive position. These included better locations and fewer units in input-supplying and marketing activities, group branding and marketing, better producer return and contract procedures, and inclusion of environmentally and socially related aspects in planning.

Increased turkey output in the Southeast with little increase in the Midwest is reducing the geographic market for Upper Midwest turkeys. If these trends continue, the Midwest may be further displaced, although excess Midwest supply over local needs could still satisfy excess demand in certain Eastern markets. Costs of production, live assembly, processing, and distributing turkeys were used in a multidimensional model. An interactive procedure is being used to determine optimum size, numbers, and location of units in the Upper Midwest.

Primary and secondary data have been collected and budgets developed for producing assembly, packing, and distributing poultry and eggs for use in input-output analyses in the Northeast. The matrices break down the industries in far greater detail than previous studies of intersector relationships.

Studies suggest further-processed markets of Southern plants, while expanding, have been largely oriented toward bulk meat products. Opportunities exist for further growth through institutional and consumer products.

Livestock

A 20-region quarterly partial spatial equilibrium analysis of the U.S. sheep industry provided distribution patterns for carcass and feeder lambs, retail and farm prices for lambs, and location advantages in the production and feeding of lambs for conditions existing in 1967. Quarterly models indicated the Northeast area consumed 53 percent and the West Coast 20 percent of the lamb supply. The Range and Intermountain States received a return to land of \$4.00 to \$13.00 per lamb produced, while Midwest and Eastern States were in the \$1.50 to \$4.00 range. Optimal location of lamb feeding reduced the industry's cost by 1.6 percent and resulted in a reduced level of feeding in the seven major lamb feeding States. Deletion of the 1954 National Wool Act production payments decreased the industry's revenue by 20 percent. The deletion and doubling of 1967 lamb meat imports would have increased and decreased revenue to domestic sheep producers by 1.6 and 3.4 percent, respectively. The results using an annual time dimension would lead to erroneous conclusions compared to the quarterly results.

Beef cattle feedlots with 10,000 head or more capacity generally enjoyed a cost advantage over the smaller feedlots, especially those with less than 1,000 head capacity. Such feeding advantages accrued primarily due to existing

economies of size, higher feedlot utilization rates, and lower labor costs as a result of higher levels of mechanization. Results further indicated that costs decreased at a declining rate as feedlots approached 30,000 head and over capacity. This suggests that feedlots have not expanded beyond the limits of present technology and that further increases in size are economically feasible.

Analyses of economies of scale in marketing from large lots of slaughter cattle indicate that: (1) marketing economies of size are present in both technical and pecuniary forms, (2) marketing costs are lower for direct marketings than for central marketings, and (3) there are some marketing cost advantages related to geographic location.

In a multidimensional transshipment model for the U.S. cattle industry with emphasis on the South, feeding and slaughter capacity and feeding costs were varied in order to measure the sensitivity and effects of selected changes of parameters: (1) The South was a major supplier of feeder cattle to the Corn Belt and will continue to be so under various changes in parameters; (2) returns to feeding facility in the South were greatly below eastern Corn Belt level; (3) returns to the slaughter facility were appreciably higher in the South than in other regions; (4) a 10-percent rise in feeding capacity brought higher returns to feeding facilities in Texas, Alabama, Arkansas, and Florida with other Southern States having slightly higher returns or no change; (5) a 10-percent rise in slaughter capacity only generally increased returns to feeding facilities in the South; Kentucky, Tennessee, Arkansas, and Oklahoma were exceptions with a small decrease; North Carolina, Texas, and Florida were the large gainers, and the losers were the Corn Belt States; (6) returns from a 10-percent rise in feeding and slaughter facilities were appreciably high in North Carolina, Georgia, and Florida but not as high as stated in item (5); changes were small in other Southern States and returns in Texas and Oklahoma were somewhat lower; (7) the Southern Plains had the lowest nonfeed cost and inclusion of this cost in the computation greatly improved the competitive position of these States.

Sugar

A history of sugar marketing was completed this year. This report traces the development of world trade in sugar from colonial times to the present. A final chapter concludes that U.S. tariffs and quotas have led to higher sugar prices in the United States since the end of World War II and have encouraged the production of non-sugar sweeteners. The most important non-sugar sweeteners are corn sirup and dextrose. Non-caloric sweeteners, saccharin and cyclamate also have increased in importance. However, major changes in U.S. sugar legislation have serious repercussions not only on the domestic industry but also on the economies of major sugar producing countries.

Vegetables

Work has been completed on an analysis of short-run economic relationships between shipping-points and wholesale terminal markets for selected winter vegetables. The analysis indicated there is a national market for lettuce and carrots. Prices for these items in wholesale terminal markets are closely correlated with supplies and prices at shipping-point markets. Thus, the

terminal wholesale price in any market closely approximates the shipping-point price plus transportation and handling charges. Due to the nature of competition between Florida and Mexico and the high perishability of the product, there was a weaker correlation between prices and supplies of tomatoes in the markets studied.

Fruits

Substantial progress has been made in developing an interregional, intertemporal activity analysis model of the apple industry. The computer program has been modified and tested for use in this specific application. Demand relationships have been developed and basic information needed in the model has been obtained from a survey of firms in the apple industry.

Grain

Linear programming analyses of the grain marketing industry were made to determine optimal geographical flows and associated interregional price differentials for hard and soft wheat and flour, durum wheat, feed grain, and soybeans based on 1966-67 supply and demand conditions. The optimum locations of grain storage and flour milling activities were determined. The results indicated that six regions had unused milling capacity and mill relocation to least-cost points would have reduced transportation costs by \$11.3 million.

Plant location and capacities, storage and handling costs, and processing costs were available from earlier research. Transportation rate equations for exempt carriers were developed under a contract with the Texas Transportation Institute.

Results of quarterly analysis indicated that the timeliness of shipments determine how efficiently storage capacity is utilized. Excess storage capacity was found in several regions and 11 regions had less than 75 percent utilization in the peak quarter.

Work is near completion on determining the actual cost of providing grain transportation services. These and other marketing costs will be incorporated into the transshipment model and analyses will provide guides to industry and public agencies for future adjustments to a transportation rate structure based on the costs of providing transportation services.

Sunflower Oil

Research has shown that sunflower seed grown in the warmer climate of the South yields an oil that is more saturated than that grown in the North. It has an iodine value of 107-115, similar to that of cottonseed oil. Southern sunflower oil is a good high quality oil and is more stable than most other edible vegetable oils which gives it an advantage in edible oil markets. It is highly regarded as a salad oil, and it can be used in the manufacture of margarine and shortening and as a cooking oil. Northern sunflower oil has more unsaturation, similar to corn oil. Sunflower oil usually sells for a premium over soybean oil.

Processing costs were synthesized for crushing sunflower seed by cottonseed oil mills. A comparison was made of 150- and 200-ton per day oil mills having both a relatively short crushing season (4 months) and a relatively long crushing season (7 months). The data indicate that crushing sunflower seed is profitable and an oil mill processing both cottonseed and sunflower seed in the same season might increase their gross profit substantially.

PLANS

Poultry and Eggs

Interregional models for eggs, turkeys, and broilers will be used to project future shifts under alternative sets of assumptions. Interfirm models will be used to determine optimum product mixes for further processing plants. The results of a series of static input-output models in the Northeast will be related to simulation analyses for eggs and poultry.

Sugar

Sweetener research during the coming year will include work on interregional competition, a descriptive analysis of the wholesale refined sugar pricing system, and further investigation of interproduct competition among various sweeteners.

Tobacco

A project is being developed to analyze the economic and sociological effects of declining demand for tobacco and technological change in the tobacco industry. The rapid changes occurring in this industry are expected to result in major shifts in resource use with accompanying readjustments in economic and sociological organization. This type of analysis is needed by policymakers to assess the impacts of alternative courses of action.

Fruits and Vegetables

Efforts to develop interregional, intertemporal activity analysis models will be continued and expanded during the coming year. Some of the resources directed to the development of the apple model will be shifted to other deciduous fruits and vegetables.

Grain

The transshipment model of the grain marketing system will be extended and modified for use in evaluating the grain storage, shipping, and merchandising activities of ASCS. The research involves the formulation of spatial models which incorporate grain blending, storage, and transit rates in a multi-regional framework. Such models will be designed to (a) determine the optimum shipping patterns from supply points to ports and other terminals (b) determine the optimum utilization of stocks to fill orders of particular quality specifications; (c) determine the optimum utilization of transit billing; and estimate the additional cost associated with alternative shipping patterns. Other work at this location will involve an analysis and evaluation of the price support

program. This relates to the determination of intermarket and shipping-point price relationships for various grains and evaluation of the competitive position of various production and consumption regions.

Oilseeds

Previous research on the economic implications of processing-in-transit privileges on the soybean industry will be extended to evaluate its effect under additional assumptions and including subsequent marketing years. Also, a new approach was developed which can quantitatively assess the consequences of alternative marketing policies and institutions on the total marketing system. This new approach utilizes price differentials to quantify the share of changing marketing costs borne by various groups of producers, marketing agencies, and consumers in the aggregate and within various geographical areas of an industry. Further validation of these analytical procedures is anticipated.

MAJOR SERVICE ACTIVITY

1. Actively participated in a Foreign Regional Analysis Division-AID demand projections project by developing an oilseed meal demand analysis and projections for six international consuming regions.
2. Supplied information to trade groups on interregional competition among egg and poultry producing areas.

RESEARCH WORK UNITS

2-59-35-01	Optimum location of livestock and meat marketing facilities in the South
2-63-24-01	Interregional competition in the poultry and egg industries
2-63-54-00	Interregional competition in the poultry and egg industries
2-68-05-08	Market structure and optimum location of domestic sheep industry
2-68-24-01	Market structure and optimum location of livestock feeding enterprises
2-68-46-01-X1	Market structure and optimum location of livestock feeding enterprises in Southern Plains
2-72-30-01	Interrelationships between the poultry and egg industries and other sectors of the economy
2-82-11-01	Development and growth of the poultry and egg industries in the South
3-81-54-00	Economic evaluation of commercial peanut utilization at the sheller level
3-92-54-00	Economics of marketing sugar

3-100-52-01	The competitive position and potential of the North Central Region in marketing fruits and vegetables
3-111-07-01	An interregional activity analysis for Northeast deciduous fruits with intertemporal extensions
3-111-50-01	An interregional activity analysis for Northwest deciduous fruits with intertemporal extensions
3-111-54-00	An interregional activity analysis for apples with intertemporal extensions
3-112-54-00	An interregional activity analysis for vegetables with intertemporal extensions
3-112-10-01	An interregional activity analysis for Southern vegetables with intertemporal extensions
10-8-38-01	An interregional analysis of the U.S. grain marketing industry
10-9-15-01	Structural changes in oilseed markets

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DEVELOPMENTS OF DOMESTIC MARKETS

SITUATION

The domestic demand for food and fiber is expanding at a rate slightly greater than the growth of the national population. The increase in total demand masks somewhat the dynamic nature of domestic markets for certain products and marketing services. It fails to reveal clearly the competition in domestic markets between agricultural and synthetic food and fiber products. Domestic markets are undergoing substantial change and development resulting from advancements in technological processing, increased discretionary spending, and a sharp change in the composition of the population. For example, advancements in technological processing have brought about a marked increase in the use of synthetics, particularly in the industrial markets. Per capita disposable income has increased by nearly 25 percent in the past decade. This provides more discretionary spending power to consumers who are demanding greater convenience in food products, items of prestige value, or other non-price attributes. The consumers of today are younger than their counterparts of the 1950's. They are more educated and a larger percentage of them live in urban areas.

Through research both Government and private industry have exerted tremendous efforts to develop new and improved food and fiber products. Substantial outlays have been made to process food and fiber items which meet the desires and needs of an affluent population. At the same time, processors have attempted to develop new or improved products which would give them a monopolistic position for at least a short-run period of time. In many cases advances in technology and processing methods have provided opportunities for reducing costs and at the same time improving product appearance, performance, and other characteristics. The end-result of new product development--maximizing the satisfaction of consumer wants and rewarding those factors in the system which serve this purpose best--is in perfect accord with basic theory supporting our type of economic system. A strong basis for research exists in the need to minimize the now tremendous costs of applying new technology and to supply the facts to assist in a more orderly adaptation to change by those producers and agencies most affected.

PROGRESS

Food Assistance Programs

Food Stamps

Preliminary findings from a study of the Alleghany County (Pennsylvania) Food Stamp Program indicate that as of January-March 1970, a relatively high percentage of eligible families with children were receiving food stamps. Non-participation was most prevalent among older persons living alone or in small family units--among both welfare and nonwelfare categories of eligibility. Results from over 1,000 interviews with samples of low income families (welfare and other) in the Pittsburgh area further show that participation in the Food Stamp Program tended to be continuous and relatively long term. Many of the nonparticipants interviewed had participated previously in the Program.

In 1968 lunch service was available to 41.4 million children in 76,000 of the Nation's 105,150 public and private elementary and secondary schools. Ninety-two percent of these schools participated in the National School Lunch Program. The Federal program was available to 4.7 million more pupils in 1968 than in 1962, with substantial growth in the number of free or reduced price lunches since that time. About 9.3 million of the Nation's school children were in schools which had no lunch program in 1968. Most of these were elementary schools with low enrollment in relatively small population centers in the Northeast and Midwest. Findings on gaps in school food service coverage and other relative information will be helpful in directing the administration of the School Lunch Program.

Low Income

Food and Nutrition Education

Data obtained through a program information reporting system indicate that at the end of June 1970, after nearly 18 months of actual field operation, the Expanded Food and Nutrition Education Program had enrolled and worked with about 347,000 families containing about 1.7 million persons. Examination of performance shows that the program is reaching the intended target population--low-income families. At the end of March 1970, close to 81 percent of the program families had annual income of less than \$4,000. The program has successfully involved both minority and urban families. Around 57 percent of the families participating in the program were from minority groups and 60 percent lived in urban areas. Slightly over 32 percent of the families were on welfare.

The need for nutrition and related education is supported by the fact that over 34 percent of the family homemakers reported having less than an eighth grade education. Less than half the homemakers, in response to questioning on entering the program as to what food and drink people should have to keep healthy, named a food in each of the four major food groups. On entering the program only 9 percent of the homemakers reported consuming at least the minimum recommended number of servings in each of the four food groups during a 24-hour recall period.

Program progress is reflected both in level of nutrition knowledge and food consumption practices. Readings on homemakers who had been in the program 6 months showed over 15 percent reporting "adequate" servings in each of the four food groups and over 19 percent for those in the program 12 months. Deficiencies were found to be greatest in the consumption of milk products and the fruit/vegetable food group. Also, achievement has been realized in increasing program families' participation in USDA food assistance programs. Increases have been more pronounced in recent months, particularly in the Food Stamp Program. During June 1970, 43 percent of the program families were participating either in the Donated Foods or Food Stamp Program, in contrast to 37 percent in June 1969.

Technical guidance and supervision were furnished for two evaluations of the FNE Program conducted by Extension Service under contract with a private research firm. Requirements call for a systems analysis and development of program models which can be used in decisionmaking. Completion is scheduled for early 1971.

Data obtained from the information reporting system have been analyzed and interpretative reports prepared monthly and semi-monthly for distribution within the Department and to FNE Program personnel at the Federal and State levels. Data are now being prepared and analyzed for a more comprehensive Department report which will examine the outreach and achievement of the FNE Program.

An indepth analysis of the program, including determination of the association between socio-economic characteristics of program families and program inputs and change or achievements of families is now underway. A sample of over 10,000 individual family records provides the primary data source for this evaluation. Results of this analysis will be available during the current fiscal year.

The Expanded Food and Nutrition Program in Louisiana is being evaluated under a cooperative agreement with the Louisiana Cooperative Extension Service. The major objective of the research is to measure the effectiveness of the program (level and rate of achievement) in securing improved nutrition knowledge and food consumption practices among participating families.

Food Distribution System

Increased consumer complaints and unrest, as well as research findings, indicate that the food distribution system performs less efficiently and responsively in the inner-city areas of our major cities than in higher income urban or suburban areas. Findings of a study of chainstore pricing practices in six cities showed no identifiable pattern of price differences between sample stores of the same chain operating in low- and high-income areas. Also, an analysis of selected factors associated with quality for a limited number of meat items showed considerable variation but no definite pattern by income areas of the city. While these research findings provide evidence that there is no discrimination against the poor by food retailing firms, the consumer who must patronize food stores in the inner-city is most likely to have access only to small stores where prices are high, limited selection, and poorer quality because of slow turnover. Fieldwork on a pilor research project to compare the performance of the food retailing system in low- and higher-income sections of the Cleveland, Ohio, metropolitan area has been completed. A final report by the contractor is expected in November 1970. The basic purpose of the research is to identify alternative marketing practices or forms which offer potential for better food service in inner-city areas.

Food Prices in Low-Income Areas

A 1969 survey of food prices in low-income areas of seven cities revealed no identifiable pattern of price increases after distribution of welfare checks. Although there were price increases and decreases, the total cost of approximately 3,900 items purchased increased less than 0.1 percent between the first and second week of the survey.

The findings are based on prices paid for selected items in stores in low-income areas of Washington, D.C.; Jackson, Miss.; Boston, Mass.; Newark, N.J.; Detroit, Mich.; Cleveland, Ohio; and Oakland, Calif. Specific food items used

frequently by low-income families were purchased in each store the week prior to the issuance of welfare checks; these same items were purchased again on the same day 1 week later and immediately after checks were issued. All purchases were made without prior knowledge of store operators.

Of the total number of items purchased, prices were changed on 14 percent between the first and second week of the survey. The monetary change, however, was slight. Although about half these price changes were increases, the net difference owing to all changes was an increase of 85 cents on a total bill of \$1,600 per week for all purchases made in all sample stores in the low-income areas.

Market Potential

Away-From-Home Market for Food

Phase II of a survey to develop a detailed profile of food usage by establishments comprising the food service industry is nearing completion. Fieldwork is finished and data tabulations are expected in December 1970. Estimates will be provided on the quantity and cost of food used by product form and container type and size for kind and size of business and type of food service offered. Where data are adequate, it will be generated for individual products. Findings will be market oriented to provide producers, processors, and distributors with guidance for better anticipating and serving the growing and changing demands of this market.

Mohair

A study of the mohair industry for the Mohair Council of America by Chilton Research Service has been completed. MED coordinated the research and consulted with the Council throughout the study. The report recommends initiation by the Mohair Council of three distinct programs: promotion, research and development, and marketing. It outlines in detail the objectives, target groups, media, and estimated costs for a promotion program. Two major promotion components are: (1) institutional promotion of mohair fibers and (2) programs for promoting mohair end products. The end product promotion phase includes men's apparel, women's apparel, interior furnishings, and rugs and carpets.

The report also recommends that the research and development program be divided into the following categories: (1) Programs undertaken in selected foreign countries using Public Law 480 funds; (2) adoption of various mohair fiber processing, fabricating, and manufacturing methods and techniques developed in foreign countries; (3) increased research efforts by USDA laboratories to improve certain properties which would increase the use of mohair; and (4) increased efforts undertaken by commercial laboratories and State universities to develop new mohair products and uses for existing products.

A well-developed production-marketing program for mohair is the third element in Chilton's recommendations. Its major components are: (1) increasing the production of finer mohair through breeding and (2) improving the system of grading, sorting, and quality control of mohair fibers.

Alfalfa

The economic-engineering approach was used to evaluate the economic feasibility of an air separation technique for dehydrated alfalfa developed by the Western Utilization Research and Development Division, ARS. Operating costs were synthesized from data representative of Kansas and Nebraska. Cost per ton for separating dehydrated alfalfa into high protein and high fiber fractions ranged from \$3.24 in the smallest model, producing 4,950 tons per year, to \$0.30 in the largest, producing 17,325 tons per year. Costs for three alternative separation flows in six model plants of different capacities were analyzed. Investment per plant increased from \$64,000 to \$81,500 for additional equipment and storage facilities. The total cost of dehydration and separation was the greatest in the smaller models, \$21.61 per ton. The largest model had the lowest cost, \$11.31 per ton. Assuming 60 percent of the output for each model was stored, average per ton cost increased to \$26.22 in the smaller and to \$14.72 in the larger model.

Research to determine the intrinsic value of the low protein, high fiber fraction is underway (in cooperation with Western Utilization Research and Development Division, ARS) using nutritional coefficients developed by ARS. Evaluation is being made for several dehydrated alfalfa products at one market over a 2-year period. Preliminary analyses indicate dehydrated alfalfa is in a better competitive position when it is considered as a nonroughage and competes with nonroughage ingredients. Further analysis will provide the price-quantity relationships and the rate of restrictions placed on certain ingredients.

Innovations in Food Processing

Dehydration

The institutional food trade is a major market for dehydrated foods. Advantages recognized in some applications by users of dehydrated foods include conveniences in storage, handling and use, reduced waste and losses in preparation and storage, and lower final food costs associated with usage of ingredients in their dehydrated form. However, quality problems limit the use of a number of dehydrated products. Only 16 dehydrated products among 116 surveyed were reported by food service managers to have achieved a "regular and repetitive" usage level. Milk, potatoes, onions, beef and chicken soup and gravy bases, and instant tea had gained the highest market penetration status.

Irradiation

Irradiation sterilizes or pasteurizes foods, depending on dosage. Very low doses that pasteurize perishable foods offer a new way to lengthen market life of fresh farm and fishery products. Analyses of economic potential for using irradiation processing on more than 60 commodities have been completed. Multiphase economic screening techniques and cost benefit analyses reduced the likely commodities to five--mushrooms, strawberries, shrimp, blue crab, and East Coast finfish. These were the only foods studied which satisfied selection criteria and offered potential benefits of sufficient scope to offset costs. The Atomic Energy Commission regards the economic research results as

a major contribution to its program, Peaceful Uses of Atomic Energy. Each proposed food irradiation facility would call for an investment of several million dollars.

SYNTHETICS AND AGRICULTURAL SUBSTITUTES

Natural Substitutes

Many agricultural commodities face competition from substitutes originating within agriculture from natural sources. In the analysis of data for making market projections on the penetration of substitutes, some significant findings have emerged.

For example, the primary source of protein for the substitute meat products in the next 5-to-10 years will be vegetable and most of this from soybeans. Manufacturers of products substituting in part for meat in such products as patties and meat loaf are concentrating on institutional markets, including Government purchasing and feeding programs.

Production and marketing of substitute fluid milk products continues to decline. Such products have disappeared from some markets and continue to decline in others. Part of the decline is a result of new regulations concerning payment for milk components used in substitute products which significantly reduce the profit margins.

Substitution of one milk product for another continues to affect milk utilization. An increasing volume of whey solids is being substituted for non-fat dry milk in commercial food processing operations. Substantial increases in whey solids coming on the market as cheese firms seek to solve their pollution problems by drying whey could have an unsettling impact upon the market for solids-not-fat.

Synthetics

Certain agricultural commodities face competition from synthetic materials. Major competition for citrus products is from powdered synthetic drinks. However, the powdered drinks have a unique market which is not expected to increase significantly in the next ten years. The market for natural juices is expected to increase resulting in a decrease in the market share for the synthetics.

In 1969 over 46 percent of the total domestic consumption of broadwoven goods was classified as manmade fabrics. This is expected to increase significantly in the next ten years as cotton continues to be supplanted by synthetic fibers.

Commodity Work at Regional Utilization Laboratories

Work in this area in the past fiscal year reflects the carrying out of stated plans to emphasize (1) providing the new Richard B. Russell Agricultural Research Center with basic data needed for a sound economic underpinning of its program, (2) reviewing agricultural material opportunities in the rapidly

expanding disposable industry, and (3) maximizing the relevancy of laboratory research on new products and processes to market requirements and consumer needs.

Work on providing economic guidelines for utilization research for southeastern agricultural commodities is exemplified by the study of the potential for peach processing in the Southeast. Research on the first phase of this work, structural characteristics of the peach industry, has been completed. The results indicate that while peach processing is dominated by the West, a potential does exist for peach processing in the South. Nationally, the amount of peaches grown and used for the fresh market has declined to 39 percent of production in 1968, while the amount grown for canning has increased to about 56 percent. The U.S. peach consumption data from 1950-68 indicate a downward trend in the consumption of all peaches. The decreasing trend in consumption of fresh and dried peaches more than offsets the increasing trend in the consumption of all canned and frozen peaches. Regional consumption data indicate consumption of canned peaches is below the U.S. average in the South and North Atlantic regions. However, the overall increasing trend in per capita consumption of canned peaches, coupled with a growth in population, makes the future demand for all canned peaches look favorable. An examination of competitive factors important in establishing an expanded peach processing industry in the South indicates that the South should have a competitive advantage in eight of the ten destination markets considered. These eight markets represent areas comprising 80 percent of the total U.S. population. Recommendations based on this study to the laboratory leadership at the Richard B. Russell Agricultural Research Center point out that research on improved processing varieties and techniques adapted to southern conditions is needed to exploit this apparent advantage.

As planned, research of the potential for agricultural commodities in the disposables industry has been completed. The market potential for natural fibers in the rapidly growing disposables industry is excellent in the bonded fiber fabric materials area. Cotton has properties that make it potentially competitive in about three-fourths of that total market, but it currently has less than one-tenth. Cotton's potential to regain a greater share of the market will be realized only if it improves in processing performance and in price competitiveness. The significance of these findings is that the current use of 12-15 million pounds of cotton in bonded fiber fabrics could potentially be expanded to 110-120 million pounds, further increasing as the industry grows. In padding materials, the success of "Cotton Flote" in auto padding, a USDA research development, suggests that research should be continued and possibly accelerated toward developments at improved performance in that substantial and growing market. Potentials for similar expanding of cotton's competitive strength in furniture padding should be explored.

Research emphasizing ways of better relating laboratory product development to market and consumer needs is reflected by the following:

The Western Lab requested assistance for guidance in their bean product development research. Our response has been to conduct a survey to determine from a panel of households recruited from among Western Lab personnel, what, if any, bean products available today are being used, how well they are meeting consumer needs and what the consumer wants in the way of new bean products.

Two households characteristics were significantly related to the total consumption of beans: (1) household size and (2) whether the major cook was used to eating beans as a child. A significant number of the younger cooks as compared with the older cooks were not used to eating beans as children or had disliked them and thereby didn't eat beans very often. Another major reason for not serving beans more often was that other foods were liked better. New bean products need to be developed which will attract the younger households. These should be convenient to prepare, attractive in appearance, and versatile in use.

A corollary effort on new bean products concerns a request to assist in determining the feasibility of a bean product processing plant as part of a rural area development plan. Other participants are ARS, the Colorado Agricultural Experiment Station, and the Four Corners Economic Development Commission. The ERS responsibility is to assist in the marketing phase by evaluating the market potentials for four new, quick cooking bean product forms that have been developed by the Western Lab. If it is found that a processing plant is feasible in the area, it will create some additional income and employment to a depressed rural area.

Other research studies completed in the past reporting year are:

(1) Potential for Wheat and Wheat Byproducts in Animal Feeds: The role of millfeeds, a byproduct of the grain milling industry and soft winter wheat as substitute feed ingredients in livestock rations were evaluated from nutritional and price standpoints. This was accomplished through parametric linear programming, a technique which balances these variables on a least-cost feed formulation basis. The use of millfeeds in a wide variety of poultry, swine, dairy and beef cattle diets in four widely separated geographic locations and at four different time periods indicates that, in general, millfeeds are of greatest importance in ruminant diets and in poultry diets with low energy requirements.

With the possibility of the corn blight reducing feed supplies, the expanded use of surplus soft winter wheat in swine and poultry rations in the South becomes increasingly important. The analysis of soft winter wheat used in swine and poultry rations indicates that soft wheat, at the going price in the spring of 1970 (\$2.11 per cwt.), would replace milo and corn in feed formulations in Southern States. At this price, wheat would constitute 75-to-85 percent of nutritionally adequate least-cost swine starting, growing and finishing rations.

The detailed computer information developed in these studies will be useful in guiding research and promotion programs on millfeeds and soft winter wheat by indicating in which feeds substitution is feasible and where, and in which feeds sales efforts should be emphasized.

(2) Market Test for Dry Whole Milk: A small-scale market test of vacuum foam dry whole milk was conducted and the results published. The results of this test established that consumer acceptance and repeat purchases of the dry whole milk provided a good chance for commercial success.

Broilers

If acceptable to consumers, marketing broilers in frozen form could provide ways of lowering marketing costs and maintaining quality. A survey of consumers was conducted in cooperation with Texas A&M to determine consumer attitudes, beliefs, and knowledge concerning fresh and frozen chickens; discover the main point of resistance to acceptance of frozen broilers; and develop, on the basis of findings, educational and promotional approaches most likely to overcome existing consumer bias toward frozen chicken. Preliminary findings include: (1) consumers believe frozen broilers are not fresh and are of lower quality than ice-packed birds; (2) frozen chicken parts are considered more a convenience item than a quality product; (3) consumers lack and need information on thawing and preparing frozen chicken; (4) consumers attach a great deal of importance to visibility of fresh and frozen chicken; and (5) consumers expect frozen chicken to be priced higher than fresh. Subsequent work will involve marketing tests to determine the significance of these findings in a practical market situation.

Hogs

A model consisting of eight behavioral equations and two identities was constructed to describe the monthly structure of the hog-pork sector of the economy in the United States for the period 1949 through 1966. This model provides a basis for estimating quantities of pork marketed and prices received without promotion. Thus, the difference between the model estimates and actual marketings and prices with a promotional program for pork would provide an estimate of the effectiveness of promotion. The model would also provide a basis for estimating the influence of a promotional program for pork on supplies and prices of beef cattle and broilers.

Promotion

Role of Promotion

Research conducted during the year has been directed to determining and evaluating: (1) factors affecting trade cooperation and support of commodity promotional campaigns; (2) consumers response to alternative quality standards in market expansion activities for Texas grapefruit; (3) factors affecting consumer acceptance and marketing of frozen broilers; (4) factors affecting the short-term price structure of pork and hogs as a basis for appraising economics of promotional programs for pork; and (5) research techniques for appraising impact of promotional programs for agricultural products.

Trade Participation

Research has been completed involving a survey of 100 major food firms to discover factors affecting trade support of commodity promotional campaigns. Factors adversely affecting trade participation in commodity promotion campaigns included: (1) competition from brand advertisers who make use of consumer incentives (cents off, coupons, etc.) and offer retailers and wholesalers approximately 150 promotions per week, which generally include advertising allowances to trade and/or other similar incentives; provide the assistance of

well-trained dealer service personnel; and support brand promotion with aggressive media advertising; (2) coincidence of poorly planned campaigns; (3) absence of adequate liaison and communication between commodity groups and the trade and/or shippers; and (4) use of unqualified field representatives by commodity organizations. Factors encouraging trade support and participation include: (1) opportunities for joint promotions of complementary products; (2) evidence for an effective program utilizing dealer incentives, strong media advertising, good-point-of purchase display materials and consumer incentives, (3) assurances of well-qualified field representatives, and (4) recognition of the importance of timing campaigns to coincide with peak seasonal supplies and demands.

PLANS

Food Distribution Systems

Findings of current pilot research to identify alternatives for improved food retailing in low-income urban areas will be evaluated. The purpose of the evaluation is to give direction and guidance to an expanded research effort to identify market organization and structure, marketing practices and techniques, and/or delivery systems which may be economically feasible in providing consumers in these areas with lower cost but responsive food retailing.

Changes and developments in the commercial food marketing system will also be examined to determine their economic impact on producers, distributors, and consumers. Plans call for a followup survey of the away-from-home market for food which will identify growth trends, changes in demand for foods, supplies and services and competitive relationships with other segments of the food distribution system. Industry cooperation and support in conducting such research has been assured.

Low Income

An indepth analysis of the Expanded Food and Nutrition Education Program will be continued with particular emphasis on identifying rate and level of achievement by participating families and the association with family characteristics and program input variables. A special evaluation is contemplated of the role of the Aide in the program and identification of factors associated with Aide effectiveness.

Changing Consumer Impacts on Marketing

A new configuration of consumer forces is emerging which portends substantial adjustments in demand for food products and marketing services, marketing strategies, and the interplay between sectors of the marketing system. Research is being initiated to identify changes in economic, demographic and other elements affecting consumer food purchases and to evaluate their potential impacts upon market development, structure, performance, and alternatives for industry or public action during the 1970's.

Promotion

Research will be initiated to determine and establish a more accurate estimate of costs of advertising in marketing. Research will be initiated to update reports issued in 1958 and 1963 on the number and extent of activities of

producer organizations conducting promotional programs for farm products. In addition, work will be expanded to develop a continuous series of data on advertising expenditures by manufacturers, processors, and distributors of products derived from agriculture. These data are necessary for analysis to determine the relative effectiveness and economic efficiency of advertising expenditures in marketing products of farm origin.

A study is being developed in cooperation with several state experiment stations to appraise the influence of advertising and promotion on consumer decisionmaking processes. This will involve decisions between and within product categories. This work will also investigate the relative influence of advertising with respect to basic food needs, nonbasic food, and other impulse items.

Research is needed by cotton producers to plan a more effective promotion program. It is tentatively planned to develop cooperative research with the Cotton Producers Institute to evaluate alternative promotional approaches as a basis for allocating its budget for maximum effectiveness.

Food Processing

Applications of new technologies to food processing (reverse osmosis, microwave energy, fermentation, amino acid fortification, etc.) alter the economics of materials and food output efficiency. Broad scale social benefits from these process innovations, as well as their impact on costs in food uses need to be assessed.

Synthetics and Agricultural Substitutes

Agricultural food and nonfood products face proliferating competitive pressures in traditional markets from synthetics and substitutes. Selected items among meat and dairy products will continue to be studied to estimate the effect on resource use and production adjustments necessary in future years to 1980 to accommodate the impact of this competition.

Dietary Shifts

Public concern about diet-related health problems (atherosclerosis, obesity, protein deficiencies, etc.) has been responsible for public health agencies generating a considerable body of research. Findings may suggest major changes in quantities, forms, or composition of foods and consequently of raw materials. Market research is needed to guide public policy actions and agricultural supply adjustments arising from health-related research findings. Saturated vs. unsaturated fats, food additives, food fortifiers, as well as various processing and preservation methods are being studied for their health-affecting influences. Research is needed which will assess the potential impact of these health oriented influences on agricultural production and marketing systems.

Open Dating

A study of open dating in Jewel Food Stores in Chicago will be conducted to obtain relevant information such as interest of consumers in open dating, cost where such can be ascertained, reaction of store personnel to open dating, etc. A sample of randomly selected stores will be utilized in which to generate the desired information.

Away-from-Home Eating

Assuming funds are provided, a followup study will be made of the away-from-home eating market beginning in fiscal 1972. The proposed study will draw on the one previously done and provide a basis for measuring trends and changes over time in the away-from-home eating industry.

Market Potentials

Shift available resources stationed at the utilization laboratories to work on environmental pollution control problems related to agricultural processing industries. All of the labs have been working on the modification of existing processes and the development of new technology to assist agricultural processing industries faced with impending enforcement of more stringent observance of pollution standards for waste disposal. All technological developments need economic research to determine costs involved and their possible impact on the competitive structure of industries. Plans are to develop economic research on the laboratories' technical developments in the pollution control area, with emphasis on fruits and vegetables (WU), dairy and leather industry (EU), oilseed processing (NU), cotton gin operations (SU), and poultry wastes and peanut shells (RBR Center).

Alfalfa

Plans are to evaluate the market potential for dehydrated alfalfa when sufficient information from feeding tests and other basic information is available on both the stem and leaf fractions.

MAJOR SERVICE ACTIVITY

1. Participated in regional meetings of the Cooperative Extension Service to report on FNE Program status, achievements, and use of program generated information for more effective program development.
2. Provided technical evaluation of proposals made to ES by private research firms for contract evaluation of the FNE program.
3. Provided consultation on research conducted by states relating to their operation of FNE program.
4. Provided special data tabulations on the National School Lunch Service as background material for White House Conference on Food and Nutrition.
5. Provided consulting service and research assistance to the Foreign Agricultural Service on Frozen Long Grain Rice Promotional Campaign sponsored cooperatively by FAS and the American Rice Council.
6. Provided consulting service to the Mid-America Group of State Departments of Agriculture on information requirements for service work with potential exporters.
7. Assisted the American Dairy Association in developing research designs for measuring sales response to promotional campaigns for fluid milk, cheese, butter, cottage cheese, and yogurt.

8. Consulted with California Raisin Advisory Board on research needs to strengthen effectiveness of promotional programs.
9. Served on Cotton Promotion Advisory Committee to the Secretary. Committee reviews and makes recommendations on the promotional program of the Cotton Producers Institute.
10. Provided consulting services to a large number of firms and industry groups as a result of recent research on such topics as freeze-drying of foods and beverages, air-dried fruits, and proteins from petroleum.
11. Serviced requests from industry, consumer organization, universities, and foreign countries on imitation products and agricultural substitutes.
12. Provided consulting services to the Consumer and Marketing Service on food costs and unit pricing.
13. Conducted exploratory work on food product dating systems in response to a Congressional request.
14. Economists located at each of the Regional Utilization Research and Development Divisions, ARS, spent approximately one-half their time furnishing data and consulting on utilization research programs.

RESEARCH WORK UNITS

2-66-54-00	Market potential for new animal products
2-70-03-01-X1	The market for dairy products and their substitutes
2-77-35-01	Relationships between availability and consumption of dairy products
9-5-17-01-X1	Economics of irradiation-pasteurization of selected farm products
9-5-54-00	Economic impact of innovations in food processing
9-6-54-00	Impact of synthetics on markets for farm products
9-7-54-00	Appraisal of trade participation in commodity promotion programs
9-8-54-00	Evaluation of sales response to promotion techniques
9-9-15-01	Economics of promotional programs for livestock and livestock products
9-9-46-01	Economics of promotional programs for livestock and livestock products
9-9-46-01-X1	Affects of alternative merchandising and promotion techniques on sales of farm products

9-10-54-00	The costs and changing role of packaging in food marketing
9-11-54-00	Evaluation of the institutional market for food
9-14-54-00	Participation in the National School Lunch Program
9-15-54-00	Industrial markets for farm products
9-22-05-02	Utilization economics at the Western Utilization Lab
9-22-11-01	Marketing economics at the Richard B. Russell Agr. Res. Center
9-22-14-05	Utilization economics at the Northern Utilization Lab
9-22-19-08	Utilization economics at the Southern Utilization Lab
9-22-40-04	Utilization economics at the Eastern Utilization Lab
9-23-54-00	Economics of alternative food nutrient sources for food aid programs
9-24-40-04-X1	Food retailing in urban low-income areas
9-24-54-00	Development of more efficient food distribution in low-income areas
9-25-19-01-X1	Improving food consumption of low-income families
9-25-54-00	Evaluation of the Expanded Food and Nutrition Education Program
9-26-54-00	Appraisal of impact of changes in food marketing on food prices and consumer practices
10-14-31-08-X1	Market potentials for cotton fabrics in selected industrial and consumer areas
10-14-54-00	Market potential for product innovations developed from fibers, grains, and oilseed products

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